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UNIVERSITY OF ALBERTA

SUNDOWN SYNDROME IN A PSYCHOGERIATRIC POPULATION

BY

YVONNE LEE BUCHANAN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN

COUNSELLING PSYCHOLOGY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

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FACULTY OF GRADUATE STUDIES AND RESEARCH

THE UNDERSIGNED CERTIFY THEY HAVE READ, AND RECOMMEND TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH FOR ACCEPTANCE, A THESIS ENTITLED SUNDOWN SYNDROME IN A PSYCHOGERIATRIC POPULATION SUBMITTED BY YVONNE LEE BUCHANAN IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN COUNSELLING PSYCHOLOGY.

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ABSTRACT

Sundown syndrome refers to diurnal variation in confusion and orientation, and persons who suffer with this often show increased agitation, restlessness, wandering, verbal behaviours, and at times aggression as the day progresses. It creates significant management problems for the care of many dementing elderly individuals, and is cited as a primary factor leading to the institutionalization of persons who might otherwise be cared for within their homes. Despite the major concerns and challenges it brings however empirical investigations have been minimal, and factors important in its development need yet to be elucidated.

In the present study 23 sundowners and 23 nonsundowners from a psychogeriatric population were compared. Investigations involved comparisons of cognitive and behaviourial functioning, as well as auditory capacities, recent relocations and roommate transfers, and use of prescribed psychotropic medications.

Results demonstrated that sundowners and nonsundowners differed in clinically meaningful ways. Findings showed that sundowners were more impaired on

cognitive and behaviourial functioning, and more impaired when the results of cognitive, behaviourial, high frequency hearing, and speech discrimination were considered together. Sundowners had also experienced greater roommate transfers in the month prior to study, although were comparable to nonsundowners on recent relocations. Furthermore sundowners and nonsundowners were comparable on abilities for speech discrimination, and abilities for low, middle, and high frequency hearing. Finally groups were comparable on use of prescribed psychotropic medications, and use of medications with anticholinergic properties. In total the findings provided further evidence for the complexity of sundown syndrome, and underscored the importance of multidimensional evaluations.

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I. INTRODUCTION

Overview of Aging and Dementing Illness

Elderly persons represent a growing and substantial portion of the population. It is reported that approximately 11 percent of the American population are 65 years of age or older, and that by the year 2000 this will rise to 15 percent. It is also estimated that by the year 2030 the number of persons age 65 and older will triple the figure of 1950 (Bernardini, 1985; Rovner, 1988).

As the number of elderly persons increases, so too does the number of elderly persons with medical and psychiatric difficulties (Annesley, 1989; Colenda, Schoedel, and Hamer, 1988; Gruenberg, 1977; Schluter, 1989). Recent surveys have found that five percent of persons over age 65 experience a dementing illness of some form, while 20 percent of persons over age 80 experiences dementia (Colenda, Schoedel, and Hamer, 1988; Kaplan, 1989; Whalley and Bradnock, 1990; Wragg and Jeste, 1988). In terms of elderly persons residing in nursing homes, 50-55 percent experiences a mental disorder, with approximately 59 percent experiencing Organic Mental Syndrome; Dementia, 19 percent

experiencing Organic Delirium, and 21 percent experiencing depressive Mood Disorder (Kafonek, Ettinger, Roca, Kittner, Taylor, and German, 1989).

Given the prevalence of elderly persons experiencing organic illness, reports on the multitude of potential disease concomitants are disconcerting. It is reported that a variety of behaviourial and psychotic symptoms are frequent corollaries of dementing illness, and accordingly are of concern to elderly persons, patients, families, and health care providers. Psychotic symptoms such as hallucinations and delusions purportedly occur in 50 percent of persons with irreversible dementias, with up to 70 percent displaying disruptive behaviours like physical assaults, wandering, and demanding and critical behaviours (Rabins, Mace, and Lucas, 1982; Wragg and Jeste, 1988). Agitation is also estimated to occur in 70 to 80 percent of those with dementia, and defined as inappropriate verbal, vocal, or motor behaviours, that cannot be explained by needs or confusion (Cohen-Mansfield, 1986; Cohen-Mansfield and Billig, 1986; Cohen-Mansfield, Watson, Meade, Gordon, Leatherman, and Emor, 1989; Rabins, Mace, and Lucas, 1982).

Overview of Sundown Syndrome

Sundown syndrome is described in the literature and clinical settings as problematic for the elderly, and particularly for dementing individuals. It is referred to in this study as diurnal variation in confusion and orientation, with persons who experience it often showing increased agitation, restlessness, wandering, verbal behaviours, and at times aggression as the day progresses. While it is not cited in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) (American Psychiatric Association, 1987) it has been identified by researchers and clinicians (Beel-Bates and Rogers, 1990; Bliwise, Carroll, and Dement, 1989; Cohen-Mansfield and Billig, 1986; Cohen-Mansfield, Watson, Meade, Gordon, Leatherman, and Emor, 1989; Evans, 1987; Forbes, Hopkins, Hamilton, and Carter-Dickson, 1981; Hall, 1988; Hall and Buckwalter, 1987; Hall, Kirschling, and Todd, 1986; Norris, 1986; Salzman, 1982a, 1982b; Stewart, 1984; Stewart, Hiscock, MacBeath, and Richardson, 1986), and described as "one of the most difficult and challenging problems facing caretakers of elderly dementia victims" (Stewart, 1984, p. 1). It has also been described as a primary factor

leading to the institutionalization of persons who might otherwise be cared for within their homes (Prinz and Raskind, 1978; Stewart, 1984), and as a syndrome that has to date remained relatively unknown.

Definition of Sundown Syndrome

The existence of sundown syndrome and the difficulties inherent in its investigation have recently received increased attention (Beel-Bates and Rogers, 1990; Bliwise, Carroll, and Dement, 1989; Cohen-Mansfield, Watson, Meade, Gordon, Leatherman, and Emor, 1989; Evans, 1987; Hall, 1988; Stewart, Hiscock, MacBeath, and Richardson, 1986). Historically however it has been a confusing phenomenon to understand, due to the lack of consensus among writers regarding its definition. It has been defined in the literature in various ways, creating difficulties in its clarity and investigation (Burnside, 1981; Eisdorfer and Fann, 1982; Feinberg and Koegler, 1982; Prinz and Raskind, 1978; Reynolds, Spiker, Hanin, and Kupter, 1983).

Ginsburg and Weintraub (1976) were the first to identify and empirically investigate sundown syndrome by name, although they neglected to define the syndrome. Instead they described a series of symptoms

that were displayed by the patients under study, and left the reader to infer that such symptoms represented their definition of the syndrome. Following this Prinz and Raskind (1978) and Reynolds, Spiker, Hanin, and Kupter (1983) wrote about sundown syndrome, and they defined it more clearly, as nocturnal variation in function. They conceptualized it to be due to disruption in the sleep-wake cycle, but failed to examine it empirically. At the same time they established a trend for greater confusion in its definition, over whether to regard sundown syndrome as nocturnal or diurnal variation in functioning.

Like the aforementioned writers, Feinberg, Koresko, and Heller (1967), and Feinberg and Koegler (1982) defined sundown syndrome as nocturnal variation in function, and also neglected to investigate it empirically. Unlike their predecessors however they purported that it was due to intrusion of Rapid Eye Movement (REM) processes into the waking state, and stated that such disturbances resulted in a demented elderly person's inability to differentiate dream from reality. Finally, Eisdorfer and Fann (1982) and Brocklehurst and Hanley (1981) defined sundown syndrome

as nocturnal variation, but unlike those before them, did not explain it to be the result of sleep disturbance. Rather they hypothesized that sundown syndrome was the result of the use of psychotropic medications, although they again did not investigate the syndrome empirically.

More recently investigators have conceptualized sundown syndrome as diurnal variation in function (Beel-Bates and Rogers, 1990; Cohen-Mansfield, Watson, Meade, Gordon, Leatherman, and Emor, 1989; Cohen-Mansfield and Billig, 1986; Evans, 1987; Forbes, Hopkins, Hamilton, and Carter-Dickson, 1981; Hall, 1988; Hall and Buckwalter, 1987; Stewart, Hiscock, MacBeath, and Richardson, 1986). Based upon studies carried out over the past few years it would also appear that researchers have shifted away from a focus upon sleep disturbance in its development, and begun to investigate for other potential factors (Beels-Bates and Rogers, 1990; Evans, 1987; Forbes et al, 1981; Hall, 1988; Hall and Buckwalter, 1987; Ropper, 1979; Stewart, 1984; Stewart et al, 1986). As of late investigators have demonstrated an interest in differentiating sundowners and nonsundowners on

cognitive and behaviourial factors, and have shown an interest in the potential role of psychosocial variables and sensory capabilities (auditory and visual) in its development.

While the factors important in the existence and development of sundown syndrome have remained relatively unknown and under investigation, consensus regarding its definition has emerged. Recent reports indicate that it is now generally conceptualized as diurnal variation in functioning, and evidenced as an increase in the level of confusion and disorientation as the day progresses. Accordingly, sundown syndrome has been defined in this study as an increase in confusion and disorientation during late afternoon and early evening.

Background to the Study

Sundown syndrome is reported to exist in approximately 12 percent of nursing home populations, and to be most prevalent in residents experiencing organic dementia (Evans, 1987). Forbes, Hopkins, Hamilton, and Carter-Dickson (1981) found that of residents in a psychogeriatric facility 57 percent of the severely demented were sundowners, while 36 percent

of the mildly to moderately demented were sundowners. Findings have indicated that sundown syndrome is associated with cognitive integrity, yet at the same time shown that cognitive impairment does not explain it in its entirety. Demented individuals do not unequivocally develop sundown syndrome, and dementia alone does not adequately explain its development.

It has been hypothesized that the development of sundown syndrome may in part be understood by a build-up or overload of stimuli and stress as the day progresses, which exceeds the dementing individuals' capacities to cope (Cohen, 1978; Stewart, 1984; Stewart, Hiscock, MacBeath, and Richardson, 1986; Zuckerman, 1969). While the ability to cope effectively tends to decline with aging in general (Miles and Dement, 1980), this is believed to be particularly so under stressful and highly stimulating environments (Cohen, 1978; Hall, 1988; Lawton and Nahemow, 1973; Lipowski, 1983; Verwoerdt, 1980). Furthermore it is believed that the threshold for coping is decreased even further in persons with cognitive deficits (Hall and Buckwalter, 1987; Selye, 1980), and it is purported that this can manifest in

the form of sundown syndrome (Hall, 1988; Hall, Kirschling, and Todd, 1986). Indeed Norris (1986) has stated that all elderly persons face changes in their individual functions and living conditions/lifestyles, and that sundown syndrome and restless behaviours may be stress reactions by dementing individuals, in response to these changes. Changes which may result in restlessness and sundown syndrome are varied, and include health problems, deteriorated hearing and vision, memory loss, decreased physical strength and flexibility, retirement, and modification in daily activities.

Sundown syndrome is a significant problem for the management of elderly and dementing patients, yet quantitative research has been minimal. A number of authors have commented upon its existence and the scope of difficulties it presents (Ginsburg and Weintraub, 1976; Hall and Buckwalter, 1987; Norris, 1986; Reynolds, Spiker, Hanin, and Kupfer, 1983; Salzman, 1982a; Stewart, 1984), but few empirical studies have been identified (Beel-Bates and Rogers, 1990; Bliwise, Carroll, and Dement, 1989; Bliwise, Lee, Carroll, and Dement, 1989; Cohen-Mansfield, Watson, Meade, Gordon,

Leatherman, and Emor, 1989; Evans, 1987; Forbes, Hopkins, Hamilton, and Carter-Dickson, 1981; Stewart, Hiscock, MacBeath, and Richardson, 1986). Regardless, research has shown that it exists in psychogeriatric populations, and that it is most prevalent in patients with dementing organic illness. Beyond that different factors have been posited as potentially influential, but little is yet known about their involvement in its development. Factors like cognitive and behaviourial abilities have been most frequently cited and investigated, while factors like sensory functioning, use of prescribed medications, and environmental and psychosocial variables have received minimal attention. Evans (1987) has found that transfer of roommates and recent hospital relocations are more prevalent among sundowners than nonsundowners, and others have cited the use of medications as influential in the development or exacerbation of cognitive and behaviourial difficulties like those seen in sundown syndrome (Salzman, 1982b; Stewart, 1984; Sumner, 1983; Wragg and Jeste, 1988).

Purpose of the Study

The purpose of this study has been to

systematically compare sundowners and nonsundowners, selected from a dementing elderly population. It has been the author's intention to gain a more complete understanding of the clinical phenomenon, by investigating factors which potentially differentiate the two groups. Factors examined include cognitive and behaviourial abilities, auditory capabilities, psychosocial factors such as recent transfers and relocations within and outside of hospital, and the use of prescribed psychotropic medications. While the study was in part limited by the institutionalized nature of the patient population utilized, it was believed that the population represented greater incidence of the behaviours associated with sundown syndrome, and the syndrome itself.

The ultimate aim for researchers and practitioners is to intervene and ameliorate in a phenomenon that is problematic and distressing for dementing elderly patients and care providers. While sundown syndrome is not in itself life threatening, current writings show that the number of elderly and dementing elderly persons in the population are increasing. Given this, the number of persons who may

in the future be at risk for the development of sundown syndrome also increases. Therefore, in order to expand our knowledge of the syndrome and to expand upon our knowledge of those at risk for its development, systematic investigations must proceed. It has been the author's purpose to begin such an endeavour, and to challenge future researchers to follow.

II. RELATIONSHIP TO PREVIOUS RESEARCH

Introduction

The following chapter includes an overview of the research and literature pertinent to this study. The literature on sundown syndrome is presented, as is information on the factors that are important in this current investigation of sundown syndrome. Literature regarding auditory functioning and the use of psychotropic medications in the elderly is also presented, in order to provide support for the inclusion of these factors in this investigation.

Documenting the Existence of Sundown Syndrome

Forbes, Hopkins, Hamilton, and Carter-Dickson (1981) presented the first empirical investigation of sundown syndrome identified in the literature. They defined sundown syndrome as diurnal variation in confusion and orientation, and were the first to document its existence. They studied 35 patients from a psychogeriatric unit in Ontario, with 18 of these diagnosed with Alzheimer's disease and 17 diagnosed with other psychiatric disturbances (i.e. Schizophrenia, Depression, Korsakoff's syndrome). Using the Kingston Dementia Rating Scale (KDRS)

(Lawson, Rodenberg, and Dykes, 1977) to measure cognitive function they then examined change in functioning across the day, between morning (before 10 a.m.) and late afternoon (after 3:30 p.m.). They repeated testing across three days with raters who were blind to diagnosis and severity of disorder, with the repeated measures noted as important. It was proposed that sundown syndrome could present as a subtle phenomenon, such that it could be missed through the use of one-shot measures.

Upon initial examination the researchers found that the groups did not differ in magnitude of change between morning and afternoon. Further analysis however revealed that when they subdivided the Alzheimer group by degree of cognitive impairment, differences emerged. They found that when the Alzheimer group was subdivided into groups of mild to moderate dementia and severe dementia, 57 percent of the severe subjects showed sundowning behaviour, as did 36 percent of the mild to moderately demented, and 15.6 percent of the psychiatric controls. Moreover they found that of the severe group there was dramatically greater magnitude of change scores (KDRS scores)

between the morning and afternoon, when compared to controls. Indeed, the severely demented group produced a mean change of 3.0 in KDRS scores between morning and afternoon, and this was indicative of significant deterioration across the day. In comparison the controls showed a mean change of -0.67 between morning and afternoon, indicative of slight improvement. The change scores for sundowners were reported as clinically significant, since a change value of two or more points has been reported as clinically meaningful.

Forbes et al (1981) provided evidence for the existence of sundown syndrome in a psychogeriatric population. Moreover they demonstrated that sundown syndrome is most evident in those with dementing illness, and that its existence is in part a function of the severity of dementia. They did not however explain or attempt to explain the syndrome in further detail, and failed to delineate any specific factors or suggestions for future investigators. They did however acknowledge the paucity of investigations to date, and stated that "comprehensive knowledge of [sundown syndrome] and the variables associated with it" (p. 140) must be forthcoming.

Stewart, Hiscock, MacBeath, and Richardson (1986) attempted, in part, to replicate the Forbes et al (1981) study, with elderly patients from a long-term facility in Saskatchewan. Subjects ranged between 65 and 99 years of age, and were grouped according to degree of cognitive impairment as measured by the KDRS. Groups of mild to moderate (N = 48) and severe cognitive impairment (N = 48) were established, and although they had hoped to obtain a group with no degree of impairment, this was not possible with their population.

Unlike Forbes et al (1981), Stewart and her colleagues (1986) administered the KDRS on only one day rather than three, and took measures before 10 a.m. and after 6 p.m., rather than before 10 a. m. and after 3:30 p. m. In addition they reported difficulty in accurately quantifying change in orientation and confusion across the day, as the severe group obtained maximum KDRS scores in morning and afternoon. Accordingly, 40 percent of the severe group obtained maximum scores in the morning and evening, and in the end they were unable to document diurnal variation for the mild to moderate or the severely demented groups.

Subsequently Stewart and her colleagues (1986) focused upon the behaviourial versus cognitive aspects of sundown syndrome, given that it is the behaviours that are cited as most problematic for care providers. Researchers asked nursing staff on the psychogeriatric unit to identify the Alzheimer patients that they believed were showing sundowning behaviour, and as a results of this, two subjects were named. Both subjects were male and 84 years of age, and were then monitored for seven days between 9 a. m. to 9 p. m. Their behaviours were coded in hourly segments, and categorized as negative, positive, or neutral. Stewart and her colleagues neglected however to define what they meant by negative, positive, and neutral behaviours, and instead merely stated that risks to safety somehow related to negative behaviours. Reference to neutral and positive behaviours was absent, interfering with the possibility of future replications.

Stewart et al (1986) found that while one subject showed greater negative behaviours as the day progressed on two of the seven days, the trend was not significant across seven days. Furthermore there was

no evidence of diurnal change for the second subject, across single days or weekly. Although they noted a trend suggestive of increased negative behaviours on one of the days, the finding was not statistically significant.

Stewart and her colleagues (1986) had difficulty documenting the existence of sundown syndrome in the psychogeriatric facility they utilized. While this may have in part reflected the nature of the population and the significant impairment within, it may also have been a reflection of their research design. They attempted to measure diurnal change in orientation on one day alone, and Forbes et al (1981) has already emphasized the importance of observations and testing across days. Sundown syndrome may present intermittently and subtly, such that accurate identification requires repeated testing within and across days.

In terms of the subjects identified by nurses as potential sundowners, Stewart et al (1986) also had difficulty finding evidence for diurnal variation in their behaviourial functioning. While it is possible that the subjects who were identified were not true

sundowners, it is equally possible that the behaviourial measures that were used, were not sensitive to the detection of change across the day. They provided minimal to no information on the instrument that was used for behaviourial observation, and provided no information on the psychometric properties of their instrument, to reliably and validly identify sundown syndrome. In concluding they acknowledged the importance of selecting subjects at levels where diurnal variation in cognitive and behaviourial functioning can be quantified, and the importance of assessment across several days. Finally they emphasized the importance of developing improved measurements for use in the future, and the need for improvement in assessment of the behaviourial features of sundown syndrome.

Factors Important in Understanding Sundown Syndrome

Evans (1987) presented the first empirical investigation of sundown syndrome that examined the factors important in its development, and the factors relevant in its alleviation and prevention. Like Forbes et al (1981) and Stewart et al (1986) Evans defined sundown syndrome as the appearance or

exacerbation of confusion during late afternoon to early evening, and hypothesized that sundowners would display greater confusion during the afternoon-evening, relative to the morning.

Fifty nine demented and thirty nondemented subjects were examined, from a nursing home population. Subjects were assessed using the Confusion Inventory developed by Evans, to identify those with sundown syndrome and to describe its behaviourial manifestations. The inventory measured 48 psychomotor and psychosocial behaviours, and included wandering, tapping, scratching, banging, screaming, attempting to remove restraints, and so forth. Behaviours were observed for 10 minutes in the morning (10 a.m. and noon) and late afternoon (4 p. m. and 6 p. m.), with the observations repeated across two days. A behaviour was coded as present (1) if it was observed during the time period, and coded as not present (2) if it was not observed. Morning scores were then subtracted from afternoon scores, and subjects who showed a given behaviour in the morning but not in the afternoon obtained negative scores, obtained positive scores if a behaviour was observed in the afternoon but not the

morning, and obtained zero if no change was observed between morning and afternoon. Scores for all behaviours were then summed across days, and a mean sundown score was calculated.

Following each observation period all subjects were rated on level of confusion using a single-item measure, so that calculations for change could be made (Matron's Overall Assessment of Confusion: Slater and Lipman, 1977). Data on blood pressure, oral temperature, and intensity of environmental lighting was also obtained, and calculations for change were completed. Information on medical diagnoses, medications, and night-time sleep habits were collected through health care records and a nursing staff questionnaire, and information on psychosocial functioning was obtained through a variety of measures. In particular, information on mental status was attained through the use of Pfeiffer's Short Portable Mental Status Questionnaire (Pfeiffer, 1975), information on [illegible]nic symptomatology was gained through the Face-Hand Test (Fink, Green, and Bender, 1952), and data on depression was obtained through administration of the Philadelphia Geriatric Center

Morale Scale (Lawton, 1972). Although Evans used the latter instrument to quantify depression this was not to be its intended use, as it was designed to be a general and reliable measure of life satisfaction in the elderly (George and Bearon, 1980). Finally Evans gathered information on subjects' gross visual and auditory capacities, and all assessments were restricted to morning and early afternoon. It was believed that the potential for fatigue or evening confusion would be lowest during these hours.

Evans (1987) identified 11 of 89 subjects as sundowners, which represented 12.4 percent of the sample studied. Like results from research already discussed, a disproportionately large number of sundowners (82 percent) were from the group who had been diagnosed with organic dementia. Subsequent analyses showed that the incidence of sundowning among the demented group was double that of the nondemented group, when differences between sample size were accounted for statistically.

Like other studies completed (Forbes et al, 1981), Evans (1987) findings indicated that the sundowners possessed significantly greater mental impairment

relative to their nonsundowner comparisons. It was also found that sundowners had been in hospital a shorter length of time, had experienced more room transfers in the month prior to study, and that 45 percent of sundowners had experienced the recent loss of a relative, death or transfer of a roommate, or transfer to hospital in the month prior to study. Evans explained these latter findings as reflections of psychosocial crises' and stressors for sundowners, which were not evidenced to the same degree by nonsundowners. No differences were found however between groups on depression, type of medication, physiological variables, and gross vision and hearing, and no differences were found in the intensity of room light between groups.

Evans (1987) stated that "clearly, mental impairment places the elderly at greater risk for developing sundown syndrome" (p. 105). Further, that not all demented and cognitively impaired individuals develop sundown syndrome, and "other precipitating or facilitating factors must be involved" (p. 105). Indeed the findings suggested that increased stress and the experience of change may put elderly persons at

greater risk for the syndrome. Since persons with dementia have a lower threshold to deal with stress and change, and since a disproportionately large number of sundowners experienced dementia, it is possible that the syndrome may be a reaction to stress and change. It is possible that the threshold for coping is exceeded when one is faced with relocation and the need to learn new social cues, or when faced with crises-type life events (death of a relative, death/transfer of a roommate). Certainly this reasoning is consistent with the theory of Hall (1988), Hall and Buckwalter (1987), and Hall, Kirschling, and Todd (1986), and consistent with the statements of Whalley and Bradnock (1990), who purported that increased agitation and agitated behaviours may be precipitated by even minor changes in the environment. Minor changes are described as an overnight stay with a relative or the change of roommate, with the latter having been evidenced by some of Evans' sundowners.

Evans' (1987) findings also indicated that the use of multiple medications and certain physical health conditions may be influential in the development of sundown syndrome. While Evans acknowledged that the

syndrome was not identified in the facility to the degree expected, it may have reflected the reportedly conservative use of medications and polypharmacy at the research site. Given the side effects and negative interactions associated with use of medications in the elderly, pharmacological involvements must be considered. Numerous researchers have identified the importance of thorough examinations for use of medications by elderly persons (Buck, 1988; Grancher, Baldessarini, and Messner, 1976; Kanowski, 1986; Lowenthal, 1987; Reisberg, Borenstein, Salob, Ferris, Franssen, and Georgotas, 1987; Reynolds, Kupfer, Hoch, and Sewitch, 1985; Risse and Barnes, 1986;), which must be similarly emphasized in investigations of sundown syndrome (Salzman, 1982b; Sumner, 1983).

In conclusion Evans' (1987) work provided an invaluable contribution to the literature on sundown syndrome, and set the stage for more thorough investigations. Despite this certain weaknesses and limitations emerged, and need to be addressed. Evans stated that no differences were found between sundowners and nonsundowners on vision and hearing, but limited the assessments to gross screening

measures. There was no attempt to complete more comprehensive auditory or optic assessments, and for reasons which went unreported, not all subjects completed the brief screening. It would seem that given the importance of sensory capacities in overall functioning, and the fact that the presentation of sundown syndrome can parallel the symptoms of sensory dysfunction, more thorough investigations were warranted. Furthermore, since both sundown syndrome and auditory impairment exist in disproportionately large numbers among dementing individuals, more detailed assessment was important. Indeed, although sensory functions have been postulated as potentially important in the development of sundown syndrome, they have not to date been systematically studied (Rowe and Besdine, 1982). Norris (1986) has conceptualized auditory deterioration as a stressor and change for elderly persons, and described this as taxing to a patient's already dwindling coping capacities. It may be that dementing individuals with auditory deficits and with decreasing coping capacities as the day progresses are more at risk for the development of sundown syndrome, as the ability to orient, understand,

and comprehend decreases across the day.

Sundown Syndrome and Agitated Behaviours

The third empirical study of sundown syndrome was presented by Bliwise, Carroll, and Dement (1989). Following from their observations that the syndrome emerged as the day progressed and sunset approached, they examined the role of illumination in its development. While Evans (1987) previously found no relationship between the intensity of room light with the syndrome or any of its associated behaviours, Bliwise et al hypothesized that sundowning behaviour was related to low levels of illumination. As such they observed patients during September when the intensity and duration of illumination levels were relatively high, and during December-January when illumination levels were relatively low. They hypothesized that sundown syndrome would be more evident during December to January, when illumination was lowest.

The researchers observed nine nursing home patients from a facility in California, whose mean age was 88 years. Patients were known by staff for their agitated behaviours, and unlike previous studies, the

majority (N = 7) were diagnosed with a cardiovascular rather than a dementing illness. Also unlike other studies the observations occurred between early afternoon to after midnight, whereas previous researchers examined change in functioning from morning to late afternoon and early evening (Evans, 1987; Forbes et al, 1981; Stewart et al, 1986).

September observations occurred four times an hour from 1 p. m. to 1 a. m., and occurred for three days a week across three weeks. December to January observations were almost identical, except that they occurred across two days rather than three. Behaviours were then coded using a behaviour rating scale designed to measure agitation (Bliwise, Lee, Carroll, and Dement, 1989), and illumination levels were measured every 30 minutes using a light meter near to the subjects' line of gaze.

The researchers reported that measurements from light readings confirmed lower illumination levels between December and January, relative to September. They did not however report on the different illumination levels across the 24-hour clock, and did not investigate whether the frequency of agitation

changed when illumination levels lowered across the day. They also failed to comment upon the impact that greater environmental changes might have had on their results between December and January, such as the Christmas and holiday season. Despite these limitations the researchers stated that the results supported their hypotheses, and showed that sundowning behaviours were related to illumination levels. They reported that greater agitation was seen during December to January, when illumination levels were lowest. They then extended their conclusions and claimed that their results provided support for the notion that decreased illumination levels across the day could explain the increased agitation seen in sundown syndrome, despite the fact that they did not examine this specifically. Based upon their design it was inappropriate to generalize from change in illumination levels across months to change in illumination levels across days, as other factors needed to be considered. Further, although they claimed that their findings showed an increase in agitation when illumination was lowest, closer examination revealed that only one subject demonstrated

significantly greater agitation in December-January, using conventional levels of probability. Three others showed no change in agitation across the two illumination levels, while the remaining three showed differences that approached but did not reach conventional levels of significance.

Finally, based upon the results already presented by other researchers, sundown syndrome has been found to be most prevalent in patients with dementing illness, who experience severe cognitive impairments. Therefore, to maximize the chances of learning about the syndrome, researchers need to be cognizant of the same during subject selection. While investigations of sundown syndrome using other populations such as that done by Bliwise et al (1989) should be encouraged, it is important to focus upon populations where the chances of identification are maximized. The importance of this is underscored by the observation that Bliwise et al were not overwhelmingly successful in identifying the syndrome in elderly cardiovascular patients, and knowledge about the dynamics of sundown syndrome remain limited.

Cohen-Mansfield, Watson, Meade, Gordon,

Leatherman, and Emor (1989) acknowledged the paucity of empirical investigations that had examined agitation and related behaviours in patients with dementia. They recognized the difficulties that these behaviours create for patients and care providers, and that greater information and effective interventions are needed. Based upon the literature written about disruptive behaviours and sundown syndrome in dementing elderly populations, they looked at the distribution of agitation across the 24 hour day. Their purpose was to obtain information that would support or refute the existence of sundown syndrome, based upon the behaviourial presentations of subjects.

Cohen-Mansfield et al (1989) selected ten nursing home patients, who were described as "most agitated" by nursing staff. All had diagnoses of Primary Degenerative Dementia of the Alzheimer Type, experienced significant cognitive impairment and behaviourial dependence, and had a mean age of 80. Their behaviours were observed using a behaviour-mapping technique designed for the study, and this allowed the researchers to systematically observe social and physical behaviours. The Agitated Behaviour

Mapping Instrument (ABMI) allowed 25 different agitated behaviours to be measured, which included verbal non-aggressive behaviours, physical non-aggressive behaviours, verbal aggressive behaviours, and physical aggressive behaviours.

Raters were trained prior to data collection, and observations were made at distances considered unobtrusive to the subjects. Observations occurred across a two month period for three minute intervals, and occurred across every hour of the 24-hour day. Raters coded the frequency of behaviours during each observation period, and constant behaviours received a distinct coding. Agreement between observers was reported as good, with an average inter-observer coefficient across behaviours reported as $r = .93$.

Results showed that all behaviours on the ABMI occurred at some time for some subjects, but that making strange noises occurred with the greatest frequency (comprised 24.1 percent of the observations). Constant requests for attention occurred in 22 percent of the observations, repetitious mannerisms occurred in 18.9 percent, throwing things or picking at and handling things inappropriately occurred in 14.4

percent, pacing occurred in 11.8 percent, and making strange movements occurred in 11.4 percent of observations. When behaviours were observed across different time frames (morning, prelunch, lunch, supper, evening, night) they found that five behaviours occurred with the most frequency across all, albeit great variability was apparent among both subjects and behaviours. They found that while one subject showed consistent agitation during morning and lunch, another showed it during afternoon and evening, and others demonstrated it sporadically throughout the day.

In order to examine for sundown syndrome more clearly, the researchers then completed an Analysis of Variance, to examine each subject-behaviour combination over the different time periods. Results here showed that while all behaviours did not occur in greater frequencies as the day progressed, some behaviours were more frequent during the evening versus morning hours. Attempts to get out of restraints, movements toward other persons, and spitting inappropriately, were significantly greater in the afternoon-evening versus morning ($p < .05$), whereas constant requests for attention and verbal aggression were more frequent in

the morning.

Cohen-Mansfield et al (1989) then examined all subjects individually, to determine the relationship of behaviour to time. Results showed that based upon the behaviours displayed, two of the ten subjects were sundowners, and demonstrated greater agitation in the afternoon-early evening relative to the morning. The remaining eight were not sundowners, and showed different patterns of agitation across the day and night. In summary then, researchers demonstrated that the relationship between agitated behaviours and time of day is complex. While some showed greater agitation in the afternoon and evening like that seen in sundown syndrome, others showed the opposite trend or no consistent trend at all between behaviour and time of day. Although it remains possible that clearer patterns would have emerged had a larger sample size been utilized, it is likewise reasonable that of the demented and agitated patients investigated, a definitive pattern between agitation and time of day did not exist. It is also probable that agitation does not represent as a simple and global group of behaviours, and that while some agitated behaviours may

occur in greater frequencies in morning or afternoon, others may show no temporal trend.

Based upon the findings just presented and the current knowledge on sundown syndrome, it is evident that the syndrome does not develop in all elderly persons with dementia, nor in all elderly demented persons who show agitation. Furthermore, it seems likely that sundown syndrome does not manifest with the identical behaviourial presentation in all persons, and that sundowners do not invariably show an increase in all agitated behaviours as the day progresses. Instead, results suggest that sundown syndrome is a complex clinical phenomenon, and that a multiple of factors have potential importance in its development. Although the existence of agitation is frequent among dementing elderly persons and perhaps those with sundown syndrome, the composite of factors that are important in its development remain yet a mystery.

Sundown Syndrome and Behaviour

The most recent investigation of sundown syndrome was a brief pilot study by Beel-Bates and Rogers (1990). Like others who recently studied the syndrome (Bliwise, Carroll, and Dement, 1989; Bliwise, Lee,

Carroll, and Dement, 1989; Cohen-Mansfield et al, 1989), they were interested in behaviourial functioning, and defined the syndrome as increased restlessness and verbal behaviours as the evening approached.

Six female subjects were selected from a nursing care facility, four of whom were diagnosed as demented, and two who were described as nondemented. Ages ranged between 67 and 91 years, subjects had resided in their same rooms for an average of two years, and subjects had been prescribed an average of 5.5 medications per day. Beyond that no information was offered on the functioning level of subjects or the methodology for group selection, except that subjects required assistance in activities of daily living.

Researchers investigated the frequency and distribution of behaviours across the 24-hour cycle, using an observation tool that measured verbal and motor behaviours. Five verbal and eight skeletal motor behaviours were observed, which had all been identified by nurses as important. The verbal behaviours included talking to others, talking to self, being quiet, calling out, and screaming, and the motor behaviours

included sleeping, sitting quietly, eating, activities of daily living, sitting fidgeting, roaming, pacing, and attempts at escape from the unit. Each subject was observed for a 10 minute period every 30 minutes between 1:30 and 4:30 p. m., for 10 minutes every 15 minutes between 4 and 6 p. m., and for a 10 minute period every 30 minutes between 6:30 and 8:30 p. m.

Beel-Bates and Rogers (1990) compared the findings of their demented and nondemented subjects, to examine for group differences. Although the numbers they used in each group were small, differences were reportedly found. Accordingly they stated that the demented group showed an increase in overall level of activity between early afternoon and late afternoon-early evening, which was reflective of the trend seen in sundown syndrome. In comparison the nondemented group showed a decrease in their activity level between earlier in the day to late afternoon-evening, which was opposite to the trend seen in sundown syndrome.

Results presented by Beel-Bates and Rogers (1990) provided support for the existence of sundown syndrome in a demented elderly population, but were limited by a number of weaknesses. The researchers neglected to

include information important to their design and findings, and in doing so, interfered with the possibility of future replications by others. From the outset they also failed to discuss the process used for subject selection, and did not delineate whether any or all of their demented subjects had been described by staff as sundowners. Beyond this they did not provide any information about the actual frequency of behaviours throughout the day, did not comment on any differences (if any) in the frequency of behaviours during the early day and evening, and failed to present any information regarding the statistical nature of their findings.

Summarizing the Literature on Sundown Syndrome

Research to date has illustrated that sundown syndrome is multifaceted and complex. Different researchers have demonstrated that identification of this phenomenon can be difficult, but that difficulties can be overcome through rigorous and systematic investigations. It has been shown that repeated measures are important (within and across days) to reliably document diurnal variation, and ultimately, to document the existence of sundown syndrome.

Researchers have demonstrated that there is a relationship between sundown syndrome and organic dementia. Sundown syndrome has been found to occur in greater numbers among elderly persons with dementia, relative to other elderly populations. Less consistently researchers have suggested that demented elderly persons and sundowners show an increase in verbal and motor behaviours as the day progresses, and that there is an association between sundown syndrome and increased agitation. The latter findings have not however received overwhelming support to date, and great variability has been evidenced both within and across subjects. Finally, one researcher has suggested that sundown syndrome may be related to difficulties reacting to change, by elderly persons with significant organic impairment. It has been purported that sundown syndrome may be associated with different psychosocial and environmental changes, such as recent transfers and relocations within and outside of hospital, recent loss of loved ones, and length of hospitalization.

Recent studies have provided greater evidence for the existence of sundown syndrome and the factors important in its development, but much is still

unknown. Investigations which continue to examine for other factors that may be equally important are therefore warranted. Researchers have suggested that behaviourial functioning, the use of psychotropic medications, change in individual functioning, and different environmental factors demand further exploration. Furthermore, that the role of auditory functioning in the differentiation of sundowners and nonsundowners must be investigated.

Auditory Function in the Elderly

Auditory impairment is defined as the "greatest disabling condition in America (Davignon and Leshowitz (1986, p. 149), with its greatest impact on elderly persons. It is the second most prevalent chronic condition affecting the physical and functional health of elderly persons (Harris, 1978; Maddox, 1987), and "the most prevalent, irreversible etiology of otologic morbidity over the entire age spectrum" (Darbyshire, 1984, p. 384). It has the potential to interfere dramatically with daily functioning, communication, and quality of life, and "after the need for survival, the need to communicate is the most important in the human needs hierarchy" (Bernardini, 1985, p. 76).

The permanent and progressive auditory losses associated with aging are categorized within epidemic proportions (Abend and Chen, 1985; Bingea, Raffin, Aune, Baye, and Shea, 1987; Blumfeld, Bergman, and Milner, 1969; Chadwick, 1984; Darbyshire, 1984; Davignon and Leshowitz, 1986; Gough and Semple, 1989; Henoch, 1979; Hinchcliffe, 1983; King-Rosen, 1979; Moore, 1977; Ordy, Brizee, Beavers, and Medart, 1979; Pederson, 1987; Pickett, Bergman, and Levitt, 1979; Rovner, 1988; Schow and Nerbonne, 1980; 1982). It has been reported that 25 to 60 percent of persons over 65 show hearing impairment, while 90 percent in nursing homes and long-term institutions experience impairment (Bingea, Raffin, Aune, Baye, and Shea, 1987; Davignon and Leshowitz; Herbst, 1981; Jones, Victor, and Vetter, 1984; Rovner, 1988).

Numerous changes occur in the auditory system with age, with impairments distributed equally across all socioeconomic levels (Abend and Chen, 1985; Blumfeld, Bergman, and Milner, 1969; Davignon and Leshowitz, 1986; Gerber and Mencher, 1980; Gladstone, 1983; Henoch, 1979; Hinchcliffe, 1983; King-Rosen, 1979; Moore, 1977; Ordy, Brizee, Beavers, and Medart, 1979;

Pickett, Bergman, and Levitt, 1979; Rovner, 1988; Schow and Nerbonne, 1980, 1982; Vesterager, Salomon, and Jagd, 1988; Weinstein, 1989). Changes include gradual but progressive sensorineural hearing loss that is usually worse for high frequencies; loss of absolute hearing sensitivity; reduction in speech discrimination and intelligibility with the greatest impairment in difficult and noisy listening conditions; reduction in the number of neurons in the auditory pathway; and decline in the ability to localize sounds (Forbes, 1984; Gerber and Mencher, 1980; Herman, Warren, and Wagener, 1977; Kaplan and Pickett, 1982; Marshall, 1981; Newman and Spitzer, 1983).

Presbycusis refers to the auditory losses that inevitably occur with normal aging. It is the result of a number of different etiological factors, and these include the impact of normal physiological aging on the auditory system; long-term exposure to noise; damage from medications that are toxic to the auditory system (long-term use of aspirin and certain antibiotics); infections or disease that impact negatively on the auditory system (complications from fevers occurring in Whooping cough, German measles, mumps, pneumonia); and

stress or genetic susceptibility (Maddox, 1987; National Research Council, 1988; Resnick, 1989; Rovner, 1988). The deficits associated with age tend to present as mild to moderate bilateral high frequency sensorineural losses. Deficits occur when there is damage within the inner ear (cochlea) or the eighth cranial nerve, and the hair cells responsible for carrying the auditory messages to the brain are damaged.

The impact of these deficits on the aging person means that certain sounds may be heard, but that they are perceived as distorted and fuzzy. Certain speech sounds are completely eliminated from audibility, and this creates difficulty for the understanding of speech and verbal interactions (Miller, 1980; Rudmin, 1983). This becomes exacerbated further when the listening environments are noisy or when speech is rapid and competing, like that found at a gathering of persons, in traffic situations, and so forth. Indeed, ability to discriminate speech after age 80 is reduced by as much as 25 percent, while normal young adults only suffer a mean loss of 2.3 percent for phonetically-balanced words (Corso, 1957; Feldman and Reger, 1967;

Maddox, 1987).

Auditory impairments can lead to inappropriate and unfavourable behaviours, and interfere dramatically with ability to communicate and function effectively (Cooper and Porter, 1975; Eastwood, Corbin, and Reed, 1981; Eastwood, Corbin, Reed, and Kedward, 1984; "Hearing linked," 1989; Hull, 1982; Jacobs-Condit, 1985; Lipowski, 1983; Ronch, 1982; Rosch, 1987; Shulman and Mandel, 1988; Struble and Silversten, 1986; Weinstein, 1989). Impairments interfere directly with ability to depict warning noises and localize sounds that are important for everyday safety and security (Schluter, 1989), and interfere with ability to cope in the environment (Henoch, 1979). High frequency losses isolate persons from environmental sounds like birds, grasshoppers, door bells, and telephones ringing, and cut them off from sounds that are important to the facilitation of social contacts. Losses are associated with poor health, dizziness, confusion, increased falls, reduced interpersonal relations and quality of life, and psychological depression (Abend and Chen, 1985; Bernardini, 1985; Bess, Lichenstein, Logan, Burger, and Nelson, 1989; Butler and Lewis, 1982;

Calvani, 1985; Gerson, Jarjoura, and McCord, 1989; Hickish, 1989; Ross and Robinson, 1984; Salomon, Vesterager, and Jagd, 1988; Weinstein and Ventry, 1982).

Auditory Impairment and Sundown Syndrome

Auditory impairments have been associated with presentations of confusion and disorientation, not unlike those seen in sundown syndrome (Abend and Chen; Cohen-Mansfield and Billig, 1986; Evans, 1987; Lipowski, 1989; Rowe and Besdine, 1982; Sloane, Blazer, and George, 1989; Weinstein, 1989). Impairments can manifest in forms that are similar to organic delirium, organic dementia, or psychiatric disorder (Corbin, Reed, Nobbs, Eastwood and Eastwood, 1984; Eastwood, Corbin, Reed, and Kedward, 1984; MacPhee, Crowther, and McAlpine, 1988; Weinstein, 1989), and it is not uncommon for auditory impairments to go undetected or inaccurately diagnosed. It is said that the existence of auditory impairment among dementing elderly persons is the most frequently unrecognized condition (Peters, Potter, and Scholer, 1988; Vesterager, Salomon, and Jagd, 1988).

Despite current knowledge about the impact of

hearing impairment on elderly persons, there is limited knowledge regarding the relationship between hearing impairment and different disorders and syndromes. While researchers have examined the relationship between auditory function and psychiatric disturbance (Cooper, Kay, Curry, and Garside, 1974; Eastwood, Corbin, and Reed, 1981; Eastwood, Corbin, Reed, and Kedward, 1984; Henoch, 1979; King-Rosen, 1979; Maurer, 1982; Thomas, 1984) and auditory function and cognitive impairment (Eastwood and Corbin-Rifat, 1989; Granick, Kleban, and Weiss, 1976; Peters, Potter, and Scholer, 1988; Uhlmann, Teri, Rees, Mozlowski, and Larson, 1989; Weinstein, 1989), consistent findings have not in the past been demonstrated. Recent studies have however reported that auditory deficits are significantly related to cognitive deficits, with dementing elderly persons having greater cognitive and auditory impairments (Uhlmann, Rees, Psaty, and Duckert, 1989; Uhlmann, Teri, Rees, Mozlowski, and Larson, 1989). Researchers have also postulated that auditory impairments are important in understanding sundown syndrome, although detailed investigations have not as of yet been completed (Evans, 1987; Hall, 1988; Hall

and Buckwalter, 1987; Norris, 1986; Rowe and Besdine, 1983).

Auditory impairments exacerbate the already dwindling coping capacities of certain elderly persons, and put them at risk for the development of dysfunctional behaviours, like sundown syndrome (Hall, 1988; Hall and Buckwalter, 1987; Lipowski, 1983; Norris, 1986). It is believed that the aberrant behaviours which often arise among hearing impaired persons do so as a result of its stressfulness, and as a result of poor coping strategies (Gough and Semple, 1989). Auditory deterioration is a significant social and psychological stressor for elderly persons, that challenges coping capacities. It is said that "older persons experience so much stress in so many areas of life, while internal and societal supports are not as available as they once were to promote comfortable readaptation . . . [Thus elderly persons with auditory deficits] have a greater likelihood of becoming disorganized, and feeling incapable of coping" (Ronch, 1982, p. 194).

Summarizing Auditory Impairment

The prevalence of auditory impairment among

elderly persons is high, and it is reportedly higher for elderly persons with organic dementia. It has also been reported that impairments often go undetected among the elderly, and that they are easily misdiagnosed. It has been documented that auditory impairments can present in forms similar to organic and psychiatric illnesses, and can create confusion in diagnosis. Impairments can lead to specific presentations of confusion and disorientation, and as such, presentations like those seen in sundown syndrome.

Given these statements, the literature suggests that sundown syndrome may be related to auditory impairment, albeit the deficits may be different or greater than those typically found in elderly persons. Based upon the literature, auditory impairments must not be overlooked in future investigations, given the potential theoretical, clinical, and diagnostic significance of such findings.

Psychotropic Medications and Elderly Persons

It has been reported that 75 percent of persons over 75 years of age are on some form of medication, while one third take four to six drugs simultaneously

(Braverman, 1981; Patel, 1982). For those in nursing homes it is said that 11 to 74 percent are taking psychotropic medications (Buck, 1988), while 7 to 92 percent of those in long-term institutions are doing similarly (Salzman, 1982a).

The use of psychotropic medications among the elderly is oftentimes unquestionably necessary and of therapeutic value (Ancill, Embury, MacEwan, and Kennedy, 1988; Rozzini, Bianchetti, Zanetti, and Trabucchi, 1989). The potential for adverse side effects cannot, however, be ignored. Lamy (1984) has reported that 20 to 25 percent of elderly admissions to Britain's acute care hospitals are the result of adverse drug reactions, while 10 percent of admissions to North American hospitals are due to drug toxicity (Petersen and Thomas, 1979; Willianeson and Chopin, 1980). It has also been reported that up to 40 percent of Britain's elderly who reside in the community are affected by adverse drug reactions, while American figures range between 12 and 17 percent. Adverse drug reactions or iatrogenic illness "caused by medications, may be the most significant treatable health problem facing physicians" (Beers and Ouslander, 1989, p. 105).

Elderly persons are vulnerable to the adverse side effects of medications, for the following reasons. The aging body has a decreased ability to absorb and distribute drugs in the blood system; the kidney becomes less able to eliminate drugs and this can be impaired further by conditions like dehydration, congestive heart failure or renal disease; the liver becomes less able to metabolize drugs with age, and this is the major site for drug metabolism; the central nervous system becomes more sensitive to drugs with age, increasing the potential for toxicity; preexisting medical conditions can contraindicate the use of certain drugs; polypharmacy is common for elderly persons, and is associated with greater potential for negative drug interactions (Annesley, 1989; Lowenthal, 1987; MacLeod and Soldin, 1986; Salzman, 1982b, 1982c; Sumner, 1983; Verwoerdt, 1981; Westfall and Pavlis, 1987; Wragg and Jeste, 1988).

Polypharmacy is a major concern when working with elderly persons. It is underscored however that "all elderly patients are at risk for the iatrogenic complications of medication use, not just the elderly patient taking many medications . . . polypharmacy may

make us think of the patient who takes a dozen medications, but the important truth is that even one unnecessary medication can place the older person at risk for an avoidable toxic reaction" (Beers and Ouslander, 1989 p. 105). Accordingly, 23 to 53 percent of Britain's nursing home residents suffer the negative effects from use of multiple medications (Lamy, 1984; Lamy 1986).

Reports on the use of multiple medications by elderly persons are disconcerting. A recent Canadian study found that of 100 new patients admitted to a psychogeriatric service, an average of 3.7 drugs had been prescribed per patient (Ancill, Embury, MacEwan, and Kennedy, 1988). Nolan and O'Malley (1988) reported that the number of drugs given to hospitalized elderly patients ranged between 5 and 6 during admission, and the numbers for those in nursing homes and long-term institutions ranged between 6 and 7. Most recently Nolan and O'Malley (1989b) showed that of 11 Irish nursing homes surveyed, only 9 percent of the residents were not on medications. The remaining received an average of 4.3 drugs, with 41 percent taking 5 or more concurrently. Sixty three percent were on at least one

psychotropic medication, 18 percent were on two, and 5 percent were on three. For those taking multiple medications, 42 percent were on combinations that were considered to have potentially adverse interactions.

Side effects for elderly persons taking medications are potentially numerous and varied. They may manifest as increased confusion, disorientation, falls, depression, sedation, impaired attention, deteriorated function, urinary incontinence, or urinary retention. They may also manifest as delirium, increased psychotic thinking, hallucinations, anxiety, aggression, hyperactivity, or marked memory disturbance. Unfortunately such presentations are often misinterpreted and misdiagnosed, and of greater concern, can lead to institutionalization (Ancill, Embury, MacEwan, and Kennedy, 1988; Beers and Ouslander, 1989; Feinberg and Koegler, 1982; Granacher, Baldessarini, and Messner, 1976; Lipowski, 1989; Raskind, Risse, and Lampe, 1987; Reisberg, Borenstein, Salob, Ferris, Franssen, and Georgotas, 1987; Risse and Barnes, 1986; Rockwood, 1989; Sloane, Blazer, and George, 1989).

Of particular concern for elderly persons are

medications with anticholinergic properties. With the advancement of age the number of cholinergic neurons decreases, and the elderly are rendered particularly sensitive to drugs with cholinergic effects. Elderly persons with dementing illness are at even greater risk due to their organic changes, and without careful attention may develop what is known as anticholinergic delirium. This can easily be mistaken for the worsening of cognitive and behaviourial functioning associated with dementia, or the presentation of psychotic symptoms often associated with dementia (Lamy, 1986; Wragg and Jeste, 1988). Indeed the use of anticholinergic medications often produces the greatest of adverse drug reactions, with 16 to 35 percent of elderly persons experiencing central anticholinergic syndrome (Lamy, 1986). Frighteningly, many institutionalized dementing patients receive more than one drug with anticholinergic properties. This becomes even more distressing when one considers the summative effects of these drugs in combination, and the cumulative effects over time (Carnevali and Patrick, 1979; Stewart, 1984). Anticholinergic medications include certain antipsychotic drugs, antidepressants,

antihistamines, antispasmodics, antiparkinsonian agents, hypnotics, and sedatives (Granacher, Baldessarini, and Messner, 1976; Stewart; 1984).

Medications and Sundown Syndrome

Given the side effects that can result from the use of medications by dementing elderly persons, and recognizing the possible role of medications in sundown syndrome (Salzman, 1982b; Sumner, 1983), examination of this relationship is warranted. Researchers have however to date neglected to rigorously investigate and analyze the use of psychotropic medications among sundowners, or to compare sundowners and nonsundowners on prescribed drug use. B. C. Forbes (personal communication, 1989) has nonetheless noted that evaluations of patients with the syndrome at Alberta Hospital Edmonton revealed greater use of prescribed antidepressant drugs among sundowners versus nonsundowners. Salzman (1982b) has also discussed the relationship between the syndrome and psychotropic drugs, and said that elderly persons who become confused on these medications, present similarly to those with sundown syndrome. Presentations are similar regardless of whether confusion is due to decreased

central nervous system arousal, anticholinergic toxicity, or toxicity to other medications. These presentations can vary from mild restlessness and concentration or memory difficulties, to more severe presentations which include agitation, wandering, assaultive behaviours, delirium, and disorientation.

Summarizing Medications

Researchers have demonstrated that the use of psychotropic medications by elderly and dementing elderly persons is associated with different risks. The use of medications by these persons is associated with strong potentials for adverse drug reactions, which can range from mild to extremely serious. Medication use by dementing elderly persons may result in behaviourial presentations of confusion and disorientation, and inaccurate identification and diagnosis are not inconceivable. Presentations can also be similar to those observed in persons with sundown syndrome, and it remains possible that medications are important in understanding its development. Given that researchers of sundown syndrome have at present failed to look at this relationship in any detail, examinations are important.

Investigations into the number and type of medications used by sundowners and nonsundowners are warranted, as are investigations into the use of medications with anticholinergic effects.

Integration and Statement of Research Questions

Based upon the literature presented in this chapter, it has been demonstrated that the factors which differentiate sundowners from nonsundowners in a dementing elderly population are relatively unknown. Sundown syndrome presents as a complex and multifaceted phenomenon, and as a result it has oftentimes been difficult to accurately diagnose. Presentation of the syndrome can be subtle and particularly difficult to identify in elderly persons with significant impairments, making systematic and repeated observations of even greater importance.

Researchers has shown that those with sundown syndrome have greater cognitive deficits than their nonsundowner comparisons. Investigations into other areas of function have however found less consistent and definitive findings, and knowledge regarding the syndrome remains somewhat limited. Although limitations may in part be accounted for by the paucity

of research to date, it is encouraging that researchers have identified factors of potential importance, for future investigations. These factors have been identified through the literature presented in this chapter, and discussed in terms of their potential to differentiate sundowners from nonsundowners in a dementing elderly population. Factors identified have included cognitive and behaviourial functioning, auditory capacities, use of prescribed psychotropic medications, and psychosocial variables of relocations and transfers, within or outside of hospital. Accordingly, the author has addressed the following questions in this study:

1. Do sundowners and nonsundowners from a dementing elderly population differ in cognitive abilities?

2. Do sundowners and nonsundowners from a dementing elderly population differ in behaviourial functioning?

3. Do sundowners and nonsundowners from a dementing elderly population differ in auditory capacities? In particular do they differ in capacities for high frequency hearing and speech discrimination

under noisy conditions, where it is known that dementing elderly persons experience the most difficulty?

4. Do sundowners and nonsundowners from a dementing elderly population differ on the use of prescribed psychotropic medications? Moreover, do they differ in the type of medications used and the use of medications with anticholinergic properties?

5. Do sundowners and nonsundowners from a dementing elderly population differ in frequency of relocations within or outside of hospital, in the month prior to study? Similarly, do they differ in the number of transfers by roommates, within the month prior to study?

III. RESEARCH PLAN AND METHODOLOGY

Introduction

The purpose of this study was to investigate sundown syndrome as it exists among dementing elderly persons, and in doing so identify factors which are important in its differentiation. This chapter describes the research design that was used to investigate sundown syndrome, and includes a description of groups and subjects, instrumentation, methodology, and statistical analyses.

Description of Subjects and Groups

Two groups of subjects participated in this study, selected from a pool of inpatients in Geriatric Psychiatry at the Alberta Hospital Edmonton. Subjects ranged in age between 60 and 88 years, and were defined as sundowners if they demonstrated diurnal variation in cognition and orientation. Subjects were defined as nonsundowners, if they showed no evidence of diurnal variation in cognition and orientation. In total 23 sundowners (14 male and 9 female) and 23 nonsundowners (12 male and 11 female) were identified and investigated, which exceeded the sample sizes that were presented in previous studies (Beel-Bates and Rogers,

1990: N = 6 nursing home residents; Bliwise, Carroll, and Dement, 1989: N = 9 agitated but not necessarily sundowning elderly; Cohen-Mansfield, Watson, Meade, Gordon, Leatherman, and Emor, 1989: N = 10 agitated but not necessarily sundowning elderly; Evans, 1987: N = 11 sundowners; Stewart, Hiscock, MacBeath, and Richardson, 1986: N = 2 sundowning elderly males).

Sundowners and nonsundowners had on average been hospitalized for a lengthy period of time, at the time of investigation. Variability was evident in length of stay for both groups, with hospitalization for sundowners ranging between one and 108 months (M = 28.61, s = 31.93) and between one and 108 months for nonsundowners (M = 20.61, s = 28.47. Demographic characteristics showed that sundowners were on average significantly older than nonsundowners; sundowners had a mean age of 76.26 years (s = 8.40) and nonsundowners had a mean age of 71.09 years (s = 7.58) [t(44) = 2.17, p < .035]. Demographics also showed that education level differed between groups, with sundowners having a mean level of 6.39 years (s = 2.73) of attained education, and nonsundowners a mean level of 9.30 years (s = 3.02), [t(44) = -3.43, p < .001].

Subjects were delimited to patients who were diagnosed by their physicians with a dementing organic illness. There was no attempt, however, to differentiate subjects on type of dementia (i.e. dementia of the Alzheimer type, multi-infarct dementia, dementia associated with alcoholism, etc.,), given current difficulties in accurate differentiation between the different forms. Furthermore, multiple diagnoses were not unusual among patients in this facility, and subjects were eligible if one of their diagnoses was organic brain syndrome. While some subjects had multiple diagnoses which included other psychiatric and functional illnesses (such as depression and paranoia), an attempt was made to exclude pure psychiatric illnesses. In the end 91.3 percent of sundowners (N = 21) had diagnoses of organic dementia, 4.35 percent (N = 1) had provisional diagnoses of organic dementia, and 4.35 percent (N = 1) had diagnoses of organic dementia and functional disorder. For nonsundowners 69.57 percent (N = 16) had diagnoses of organic dementia, 21.74 (N = 5) had diagnoses of organic dementia and functional disorder, and 8.7 percent (N = 2) had diagnoses that were still

being queried.

Informed consent was obtained from all subjects or guardians prior to administration of testing. The researcher explained the purpose and procedure to all subjects or guardians, and the appropriate hospital forms to acknowledge consent were signed. When guardians were not geographically available to sign for consent the explanations were given by telephone, and forms to acknowledge consent were relayed through the mail.

Not all subjects who were initially identified as potential subjects were testable and included, due to different factors. Of the wards that were utilized, 16 out of 51 subjects who were initially identified as potential sundowners (by nurses) were excluded, while 3 out of 27 potential nonsundowners were excluded. The reasons for exclusion included advanced cognitive impairment that negated testability, resistiveness and verbal aggression, wandering, and communication difficulties. Exclusion due to subjects' gross cognitive impairment was found to be the greatest reason for elimination, such that many potential sundowners showed a ceiling effect on the KDRS testing.

Maximum KDRS scores were often obtained in the morning and afternoon, which interfered with ability to quantify diurnal change.

Once groups were established, statistical analyses of the repeated KDRS measures (taken across the day) confirmed that sundowners experienced significant diurnal variation in functioning, and nonsundowners did not. Examination of test scores between morning and afternoon showed that sundowners had a mean change of 1.54, while nonsundowners produced a mean change of -.20, $F(1, 44) = 90.05$, $p < .0001$. On average the sundowners attained greater KDRS scores in the afternoon versus the morning, indicative of deterioration in level of confusion and disorientation across the day. Nonsundowners showed a dissimilar trend, and obtained slightly lower average scores in the afternoon versus the morning (evident by the negative value in mean change scores), indicative of improvement rather than deterioration across the day. Moreover, group comparison of KDRS scores across the day showed that sundowners were more impaired overall, in both the morning and afternoon. Evidence of group differences in the morning are important, as they

illustrate that any group differences which might exist in the afternoon are not merely a reflection of sundowning phenomenon and change/deterioration as it manifests across the day. Rather, fundamental differences exist in the morning as well, albeit differences may become greater as the day progresses. Analyses of Variance on KDRS scores in the morning produced the following findings, F (1, 44) = 10.87, p < .002, with afternoon comparisons showing similar group differences, F (1, 44) = 26.081, p < .0001.

Group membership was delimited by the patient population at Alberta Hospital Edmonton, and the impairments and behaviourial problems that existed. It was also delimited by the fact that only subjects who were able to respond to testing were included, and only subjects who were of high enough functioning to show diurnal change (if any) across the day on the instruments used, were included. This meant that subject selection was typically delimited to those within the mild, moderate, and lower limits of severe cognitive impairment.

Instrumentation

The following instruments were used, and

administered to all subjects.

Kingston Dementia Rating Scale (KDRS) (Lawson, Rodenberg, and Dykes, 1977)

The KDRS (See Appendix A) is a 21 item questionnaire, designed to measure overall degree of organic impairment or confusion in the elderly. In this study it was used to assess orientation specifically, and to assess for emotional control, expressive and receptive language, dressing ability, hoarding behaviours, motor restlessness, and incontinence. Each item was scored as zero or one, with zero indicative of no impairment, and one, indicative of impairment.

The KDRS has been used by other researchers in their investigations of sundown syndrome (Forbes, Hopkins, Hamilton, and Carter-Dickson, 1981; Stewart, Hiscock, MacBeath, and Richardson, 1986). Furthermore it has been, and continues to be used frequently, as a component of a neuropsychological test battery in Geriatric Psychiatry at the Alberta Hospital Edmonton. It has also been used extensively at Kingston Psychiatric Hospital.

The KDRS is considered to be relatively non

threatening to patients, and it is straight-forward and easy to score. One of its strengths is that it forces interaction between the subject and examiner, yet it can be administered quickly. Total administration time rarely exceeds 10 or 15 minutes.

The KDRS distinguishes between demented and non-demented patients, and between different diagnostic groups (Pelletier, Hopkins, and Hamilton, 1991). Total KDRS scores are reported to discriminate between patients with organic and functional illnesses ($p < .001$), and between patients with organic illness and those living in homes for the elderly ($p < .001$). It is said to possess high inter-rater reliability, and be minimally influenced by rater bias. Inter-rater reliability estimates are reported as $r = .97$ for total KDRS scores, with reliability coefficients for individual items ranging between $r = .21$ for emotional lability, to $r = 1.0$ for orientation to person, orientation to year, orientation to month, orientation to day of week, orientation to surroundings, orientation to age, and ability for written language (Pelletier et al, 1989).

Test re-test reliability coefficients demonstrate

the stability of KDRS test scores over time. Reliability estimates for total KDRS scores after two weeks are reported as r = .78 (Lawson, Rodenburg, and Dykes, 1977), r = .84 after 4 weeks, r = .85 after 8 weeks, r = .82 after 12 weeks, and r = .76 after 16 weeks (Pelletier et al, 1991). Internal consistency estimates for overall Kuder-Richardson coefficients are reported as r = .86 (Lawson et al), with an overall alpha coefficient reported as r = .88 (Pelletier et al). Internal consistency alpha coefficients are also reported for individual subscales, with estimates for the orientation subscale (10 items) being r = .87, r = .69 for emotional control (2 items), r = .78 for language (5 items), and r = .44 for motor behaviours (4 items) (Pelletier et al).

In terms of criterion-related validity, the KDRS has been shown to correlate with other measures designed to measure the same construct--in particular, organic impairment. Pelletier et al (1991) obtained KDRS scores from 145 psychogeriatric patients diagnosed with organic dementia, and compared these to test scores from the Folstein Mini Mental Status Examination (MMSE) (Folstein, Folstein, and McHugh, 1975). Test

scores were obtained at the same time and by the same rater, and the overall correlation coefficient was r = -.89. The negative value was not unexpected, in that lower scores on the MMSE and higher scores on the KDRS, were indicative of cognitive deterioration.

Further support for the criterion validity of the KDRS was reported by Helmes, Csapo, and Short (1987). They stated that the KDRS correlates with scales where it is most expected on the Multidimensional Observation Scale for Elderly Subjects (MOSES), and added that the MOSES is in itself a reliable and valid tool for assessment of institutionalized elderly patients. Unfortunately however, they failed to support their statements through the presentation of statistical findings.

Clifton Assessment Procedures for the Elderly (CAPE) (Pattie and Gilleard, 1983)

The CAPE consists of the Cognitive Assessment Scale (CAS) and the Behaviourial Rating Scale (BRS), which are two independent measures used either separately or in combination. The CAPE has been used extensively in studies of elderly persons, and has been found to be particularly useful with elderly persons

residing in institutions (Armstrong-Esther and Browne, 1986; Bailey, Brown, Goble, and Holden, 1986; Bell and Gilleard, 1986; Brewer, 1984; Chadwick, 1984; Gilleard, Belford, Gilleard, Whittick, and Gledhill, 1984; Lam, Sewell, Bell, and Katona, 1989; McLaren, Barry, Gamsu, and McPherson, 1986; McPherson, Gamsu, Cockram, and Cooke, 1986; Pattie and Gilleard, 1978b). Like the KDRS it reliably differentiates between organic and functional disorders (Pattie and Gilleard, 1975; Pattie and Gilleard, 1976), particularly when using the Information/Orientation subtest of the Cognitive Assessment Scale. The CAPE has been described as valuable in both the detection and prediction of change in functioning over time (Bell and Gilleard, 1986; Brewer, 1984), and in establishing prevalence rates of dementia and levels of dependence in long-term care facilities (Donnelly, Compton, Devaney, Kirk, and McGuigan, 1989).

Research into the CAPE dates back to 1973. It has undergone a variety of investigations and revisions since that time (McPherson, Gamsu, Kiemle, Ritchie, Stanley, and Tregtaskis, 1985; McPherson and Tregaskis, 1985; Pattie, 1981), and is now considered to be of

particular value with elderly persons in long-term care facilities (Donnelly, Compton, Devaney, Kirk, and McGuigan, 1989; Pattie and Gilleard, 1976; Smith, Ballinger, and Presly, 1981). For this reason it is considered to be valuable for the investigation of sundown syndrome, given the prevalence of this syndrome in psychogeriatric facilities and long-term care institutions.

Cognitive Assessment Scale

The CAS (See Appendix B) covers three general areas: 12 items measuring current information and orientation; 4 items assessing mental abilities like counting, reading, writing, attention and concentration; and a psychomotor task measuring fine-motor skill and eye-hand coordination. These sections yield independent scores, and also a total score reflective of overall cognitive abilities. Although the CAS is not intended to be a test of intellectual functioning it has been found to correlate significantly with group IQ (Smith, Ballinger, and Presly, 1981), although it is better at evaluating the existence and degree of impairment in mental functioning. The CAPE has a well developed system for

grading subjects according to their level of mental impairment, and in combination with the KDRS, provides a good assessment of cognitive capacities.

Test-retest reliability estimates from a study of elderly psychiatric patients show coefficients of r = .87 for information/orientation, r = .89 for mental abilities, and r = .79 for psychomotor abilities, over a three to four day period (Pattie and Gilleard, 1983). In addition, test-retest reliability estimates from a study of non-pathological and non-hospitalized elderly persons (carried out over a six month period) yielded coefficients of r = .84 for information/orientation, r = .74 for mental abilities, and r = .69 for psychomotor abilities (Pattie and Gilleard, 1983).

Concurrent validity of the CAS information/orientation section has been examined through comparison with the Wechsler Memory Scale. A correlation coefficient of r = .90 was obtained between the two, and information/orientation correctly predicted organic status 90.5 percent of the time (Pattie and Gilleard, 1983). Further evidence of CAS validity was established through content analyses, and has been reported for all of the CAS subtests

(information/orientation, mental abilities, and psychomotor abilities).

Behaviourial Rating Scale (BRS)

The BRS (Appendix C) is designed to assess elderly persons on a number of ability/disability areas. It covers four principal areas, which include physical disability, apathy, communication difficulties, and social disturbance. It can be administered by family members or care providers who are familiar with the patient, and completed quickly. Independent scores are obtained for each of the individual areas, and total scores which reflect behaviourial ability/disability level are obtained. This information is then used to rate each subject, according to the degree of support required, relative to their level of ability or disability (McPherson, Gamsu, Kiemle, Ritchie, and Stanley, 1985).

Behaviourial ratings are considered to be inherently less reliable than test scores, like those obtained in the CAS. As a result inter-rater reliability becomes of more concern, relative to the stability of scores over time. A number of studies have investigated the inter-rater reliability of the

BRS using different geriatric populations, and of particular interest for this study are those which focused upon more chronic psychogeriatric patients. These populations best characterize the patient population found at Alberta Hospital Edmonton, where this study was completed. Inter-rater reliability coefficients from two studies that used chronic psychogeriatric patients are r = .85 and r = .86 for physical disability, r = .81 and r = .87 for apathy, r = .54 and r = .72 for communication difficulties, and r = .69 and r = .72 for social disturbance respectively (Pattie and Gilleard, 1983).

Concurrent validity of the BRS has been demonstrated through its ability to differentiate elderly populations on disability and need level. The BRS has been shown to discriminate between different degrees of disability, among elderly persons within the same population and environment (Pattie and Gilleard, 1978a; 1978b).

Auditory Measures

The audiologic test protocol included pure tone air conduction and speech discrimination in quiet and noisy conditions. The protocol that was selected,

represented the most effective method by which to quantify auditory functioning (Darbyshire, 1984).

Pure Tone Thresholds (PTT), Air Conduction

PTT air-conduction measures the least intense tone that each subject hears at various frequency levels. In this study the hearing levels were defined as the average decibel loss across ears, at octave intervals of 250, 500, 1000, 2000, 4000, and 8000 Hz. Calculations and comparisons were made at each frequency level respectively, and not based upon average scores.

Pure tone thresholds were measured using a AAC8582PSL Qualitone Acoustic Appraiser, calibrated to the specifications of the American National Standards Institute (ANSI, 1969). TDH-39 headphones were placed properly on subjects' external ears, and signals were relayed to the audiologist when a test tone became audible. Subjects raised a finger or stated aloud to the audiologist, when a test tone was heard.

Thresholds were determined using a standardized method of threshold exploration. Tones were presented in an "up 5 and down 10" manner, meaning that the first tone was presented well above threshold, and reduced

successively in 10 db steps until no longer audible. Intensity levels were then increased by steps of 5 db until tones were heard, with all tones presented for one to two seconds. Hearing level/threshold for each frequency was defined as the point at which tones were heard nearly 100 percent of the time, and below which they were rarely if ever heard. Threshold levels were established only after several threshold crossings.

Speech Discrimination Tests (SDT): Quiet and Noisy Conditions

SDT assesses ability to understand speech and discriminate between different speech sounds. It provides information on degree of discrimination difficulty, probable site of pathology, and viable recommendations for treatment and rehabilitation.

Standard phonetically-balanced word lists made by Qualitone were used (See Appendices D-G). Half lists which were comprised of 25 items were presented to each ear, using an auditory tape and TDH-39 headphones. Stimulus words were presented at the most comfortable level above threshold, and subjects responded to each stimulus word by repeating aloud those that were audible. Responses were recorded as correct or

incorrect, and a speech discrimination score was determined based upon the percentage of words correctly identified in each ear condition. Similar formats were used in both the quiet and noisy conditions, with the latter condition having the addition of cafeteria noise in the background of the tape recording.

Procedure

Groups were in part determined on the basis of evaluations made by nursing staff. Nurses on each unit were asked to identify those patients with organic dementia, and based upon their clinical judgement, rate which ones demonstrated sundown syndrome and which ones were nonsundowners. The definition and explanation of sundown syndrome was given to nurses in advance, by the researcher.

All subjects who were rated as potential sundowners and nonsundowners were assessed, using the KDRS. In those instances where potential sundowners were not confirmed as the same through testing, they were removed from the study. These subjects were not then considered for the nonsundowner group, despite being disconfirmed as sundowners. Similarly, when those rated as potential nonsundowners showed

sundowning on the KDRS, they were not included as sundowner subjects. Subjects were only included if both ratings and test results were congruent.

Once potential sundowners and nonsundowners were identified by nurses, the second aspect of group selection was completed. Specifically the KDRS was administered to all subjects in the morning (between 8:30 a. m. and 10:30 a. m.) and afternoon (between 3:00 and 5:00 p. m.), across three days (Monday, Wednesday, and Friday). Subjects who were initially rated by nurses as sundowners and who also showed change on at least two of the three days across KDRS scores (change from morning to afternoon, indicative of greater confusion or disorientation as the day progressed), were delineated as sundowners. Subjects who were initially rated as nonsundowners and showed no change on KDRS test scores on at least two of three days (did not show increased scores between morning and afternoon), were delineated as nonsundowners.

Once groups were established the sundowners and nonsundowners were compared on different variables. Given that sundowners represented a largely unstudied population, a diversity of information was gathered.

The researcher began by conducting a detailed review of the subjects' charts (specifically clinical and nursing notes), to determine the development of illness. This ensured that sundown syndrome was distinguished from organic delirium, since presentation of the two are similar. Patients with both show impairments in cognition, attention, psychomotor behaviours, and sleep-wake patterns, and tend to be more pronounced at night or as the day progresses. Unlike delirium however, sundown syndrome does not reportedly develop suddenly, and does not present with a brief duration of illness, that either resolve itself or ends in death (Evans, 1987). A detailed review of the clinical history of symptom development was therefore completed, and particular attention was paid to the development of and change of symptoms over the 24 hour circadian cycle. This procedure was carried out in order to reliably distinguish delirium from sundown syndrome, and has been used by others to distinguish between different disorders in the elderly (Lipowski, 1989; Whalley and Bradnock, 1990; Zarit, Orr, and Zarit, 1985).

A detailed review of the subjects' medical records

was also completed, to gather demographic information such as age and gender. Further, data on psychotropic medications was attained, and with the assistance of a clinical pharmacist, medications were coded according to their level of anticholinergic properties (none, low, moderate, or high properties). Finally, admission and ward information for subjects was gathered, including information on any relocations of subjects (on the ward or in the hospital) during the month prior to study, and any transfers of roommates (roommates in or out of subjects' rooms) in the month prior to study. An assessment of cognitive functioning was then completed using the CAS, and an assessment of behaviourial function was completed, using the BRS. Test administrations were all limited to the afternoon hours, when sundowners and nonsundowners were expected to be most different.

Finally a standard auditory test battery was administered, by a certified Clinical Audiologist. The audiologist had prior experience with the assessment of elderly persons, and had experience with the assessment of patients residing in psychogeriatric facilities.

Auditory testing was completed in a quiet office

at Alberta Hospital Edmonton, and was standardized for all subjects. It was carried out at the same time of day for all, with the schedule running between one and four in the afternoon. Testing lasted about 20 minutes per subject, according to whether all tests were administered. Five out of 23 sundowners (21.74 percent) were not successfully tested using the measures selected, and four of 23 nonsundowners (17.39 percent) were similarly not tested. The reasons for this included confusion, wandering, communication difficulties, resistiveness, and so forth, with sundowners more often excluded for confusion and wandering, and nonsundowners more often excluded for resistiveness. All assessments that were successfully completed however, were rated as reliable by the audiologist. Although some subjects did own hearing aids at the time of testing, none were used during testing.

Given the procedures outlined, the following research questions were asked. The alpha level of $p < .05$ was set for the statistical procedures completed, and established as necessary for rejection of the null hypotheses.

1. Do sundowners experience greater cognitive impairments than their nonsundowner comparisons, as indicated by scales on the Cognitive Assessment Scale (CAS) of the Clifton Assessment Procedures for the Elderly?

2. Do sundowners possess greater impairments than nonsundowners in behaviourial functioning, as measured by the Behaviourial Rating Form (BRF) of the Clifton Assessment Procedures for the Elderly?

3. Do sundowners differ from nonsundowners on auditory capacities, and show greater impairments in high frequency hearing and speech discrimination capacities?

4. Do sundowners differ from nonsundowners, and show a greater number of relocations and roommate transfers in the month prior to investigation?

5. Do sundowners use greater numbers and different types of prescribed psychotropic medications when compared to nonsundowners, and use medications which possess greater anticholinergic properties?

IV. RESULTS

The current study involved an examination of two groups of elderly dementing patients, residing in the same psychogeriatric facility. Patients had comparable medical diagnoses, and groups were differentiated on the basis of demonstrating diurnal variation in functioning. Subjects who showed increased confusion and disorientation in the late afternoon to early evening were labelled as sundowners, while those who demonstrated stability in functioning across the day were classified as nonsundowners.

Research to date has provided limited information on the factors important in the development of sundown syndrome. As a result the purpose of this study was to investigate subjects defined as sundowners and nonsundowners, and identify factors which differentiate the two groups. Factors which were identified by previous researchers as important in the development of the syndrome were selected. These included: (a) cognitive functioning, (b) behaviourial functioning, (c) auditory capabilities, (d) use of psychotropic medications and use of medications with anticholinergic effects, and (e) recent psychosocial or environmental

changes, such as relocations and transfers within and outside of hospital.

Sundowners and nonsundowners were assessed and compared on the factors cited above. It was hypothesized that in addition to showing differences in diurnal variation, sundowners and nonsundowners would differ on level of cognitive, behaviourial, and auditory function. Further, it was hypothesized that they would differ on the use of prescribed psychotropic medications and on the frequency of recent transfers and relocations. Accordingly, each research hypothesis has been restated at the beginning of each section, and pertinent and appropriate conclusions are presented.

Hypothesis 1

Sundowners and nonsundowners selected from a dementing elderly population differ on cognitive abilities, as measured by the Cognitive Assessment Scale (CAS) of the Clifton Assessment Procedures for the Elderly (Pattie and Gilleard, 1983). It has been hypothesized that sundowners will show greater cognitive impairments, relative to nonsundowners.

To test this hypothesis a series of statistical analyses were undertaken, to examine for group

differences. Firstly, groups were compared on overall level of cognitive functioning, as measured by total scores on the CAPE. Secondly, groups were compared on individual scores on the CAPE subtests, which measured information and orientation, mental ability, and psychomotor ability. Analyses which statistically controlled for age were utilized, given group differences on chronological age.

Sundowners and nonsundowners were found to differ on cognitive integrity, with sundowners demonstrating the greatest degree of impairment. Statistical analyses showed that on the three cognitive subtests which assessed orientation to time, place, and person (information), language and mental abilities (mental ability), and psychomotor abilities, sundowners consistently demonstrated greater impairments relative to nonsundowners. Accordingly, a Multivariate Analysis of Covariance (MANCOVA) was used which weighted and compared the three cognitively-based subtests together, and produced overall findings of statistical significance, F (3, 41) = .484, $p < .01$.

Given overall findings of significance as determined by the Multivariate Analyses presented, a

series of Analyses of Covariances were done. The subsequent analyses were completed in order to determine which of the cognitive subtests that were included in the CAS, were different between the two groups. The results of these analyses can be seen in Table 1.

Table 1

Means, Standard Deviations, F Values, and Probabilities for Sundowners and Nonsundowners, on CAPE Subtests of Cognitive Functioning

	Sundowners		Nonsundowners			
CAPE Item	M	S.D.	M	S.D.	F	p
Information/ Orientation	3.22	2.04	7.04	3.31	16.78	.0001*
Mental Ability	5.61	2.76	7.74	3.15	6.82	.012*
Psychomotor Ability	3.52	3.93	7.66	3.80	10.53	.002*

*p < .05

As can be seen in Table 1, the results that were obtained are similar to those cited above for the multivariate analyses. Findings demonstrate that sundowners are consistently more impaired than their nonsundowner comparisons, on all cognitive subtests. Sundowners are markedly more impaired on information and orientation capacities, and more impaired on mental and psychomotor abilities. Furthermore, differences are

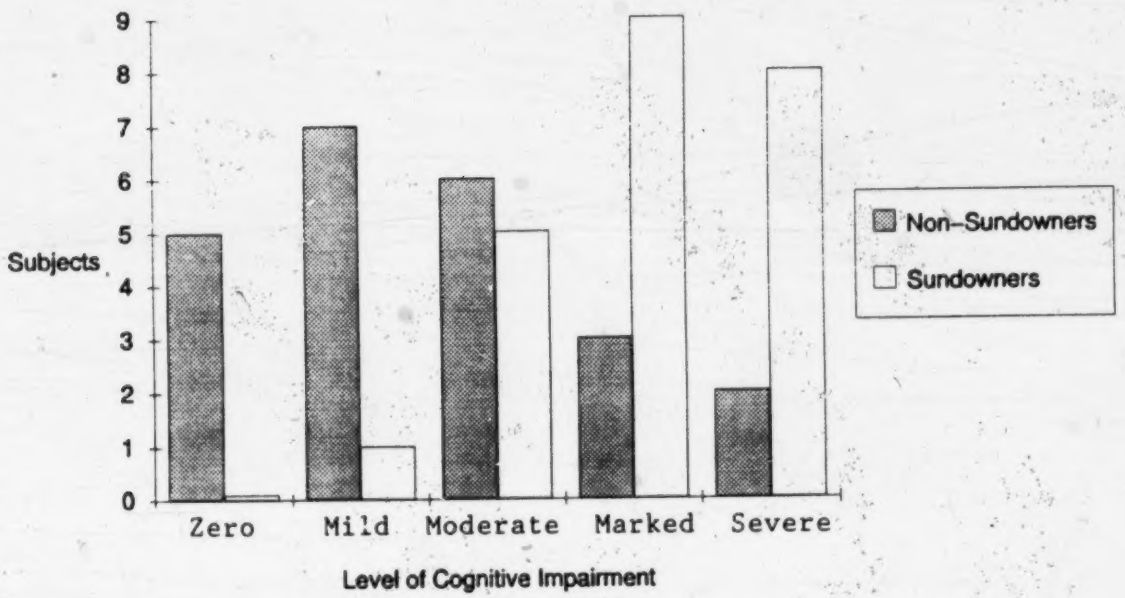
found when groups are compared on total cognitive capacities, as determined by composite CAPE scores. An analysis of Covariance produced the following findings, indicative of group differences on total cognitive abilities, F (2, 43) = 17.911, $p < .0001$.

Further examination of the actual breakdown of cognitive scores on the CAPE also revealed important differences between the sundowners and nonsundowners. Specifically it was found that in terms of classifying degrees of impairment, greater numbers of sundowners represented the upper levels of impairment and deficit. It was found for example that 74 percent of sundowners fell within the "marked" to "severe" levels of cognitive impairment (N =17), while a comparative 22 percent of nonsundowners (N = 5) were classified as markedly to severely impaired in cognitive function. Indeed, 52 percent of the nonsundowners (or N = 12) fell within the "zero" to "mild" classifications of cognitive impairment, while no sundowners were represented by zero degrees of cognitive impairment, and only one sundowner (4 percent) possessed mild cognitive impairment. Subsequent analyses confirmed that the differing levels of cognitive impairment

(marked to severe and zero to mild impairment) were not evenly distributed between groups, with significant differences evidenced between sundowners and nonsundowners on distribution of low and high levels of cognitive impairment. Chi-Square analyses produced the following significant findings, χ^2 (1, N = 35) = 15.84, $p < .05$ (see Figure 1 for the breakdown of cognitive functioning into categories of impairment, from low to high levels of deficit.

Figure 1

Number of Sundowners and Nonsundowners Displaying Differing Degrees of Cognitive Impairment, from Low to High Levels of Deficit



Hypothesis 2

Sundowners and nonsundowners selected from a dementing elderly population differ on behaviourial functioning, as measured by the Behaviourial Rating Form of the Clifton Assessment Procedures for the Elderly. It has been hypothesized the sundowners will demonstrate greater impairment in level of behaviourial functioning, relative to nonsundowners.

Analyses of behaviourial functioning involved a comparison of sundowners and nonsundowners on total behaviourial level scores, as measured by the Behaviourial Rating Form of the CAPE. Furthermore, comparisons were made between groups on individual subtests, which measured four individual areas of behaviourial function. Individual subtests assessed for level of physical disability specifically, as well as for level of apathy, communication difficulties, and degree of social disturbance.

Results of statistical analyses showed that as a whole, differences were evident between the sundowners and nonsundowners on level of behaviourial functioning. Like the findings already presented for cognitive functioning, sundowners again showed a consistent trend

indicative of greater impairment. Results from a MANOVA showed that when all the behaviourial subtests were weighted and compared together, significant group differences were evident, F (4, 41) = .33953, $p < .01$.

Given the overall findings of statistical significance as determined by the MANOVA, a series of subsequent Analyses of Variances were completed. This was done in order to determine which of the behaviourial subtests that were included on the CAPE differed between groups. Results showed that of the four behaviourial subtests assessed by the CAPE, groups were different on three. The only behaviourial subtest that was not different between groups, was one that measured level of physical disability [F (1, 44) = 2.04, $p < .16$]. In comparison the three remaining behaviourial subtests showed significant differences between sundowners and nonsundowners, with the sundowners showing consistently greater impairments. Results of these analyses are illustrated in Table 2.

Table 2

Means, Standard Deviations, F Values, and Probabilities for Sundowners and Nonsundowners, on CAPE subtests of Behaviourial Function

	Sundowners		Nonsundowners			
CAPE Item	M	S.D.	M	S.D.	F	p
Physical Disability	6.43	2.79	5.17	3.19	2.04	.161
Apathy	7.22	1.70	5.57	2.64	6.35	.015*
Communication Difficulties	.91	.95	.30	.56	7.02	.011*
Social Disturbance	3.35	2.22	1.91	1.95	5.40	.025*

*$p < .05$

As can be seen in Table 2, sundowners and nonsundowners were found to differ on overall degree of apathy, as measured by the Behaviourial Rating Form of the CAPE, [F (1, 44) = 6.35, p > 015. In addition results showed that groups differed on overall degree of communication difficulties [F (1, 44) = 7.02, p <

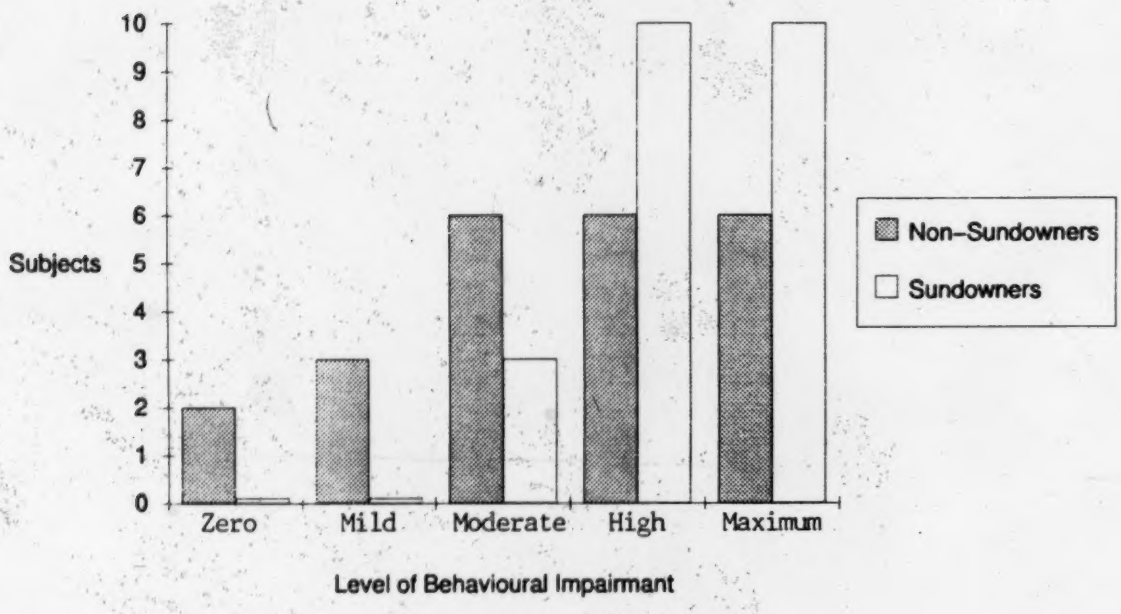
.011, and on degree of social disturbance [F (1,44) = 5.40, $p < .025$. Finally, when total behaviourial capacities as measured by composite CAPE scores were compared, sundowners demonstrated statistically greater behaviourial impairment, F (2, 43) = 7.397, $p < .01$.

Subsequently groups were compared in terms of their breakdown into actual categories of behaviourial functioning, as measured by the rating system included in the CAPE. Here greater information regarding actual levels of functioning was attained, which provided a clearer picture of the groups on their respective ability levels. It was found that 87 percent (N = 20) of sundowners fell within the "high" to "maximum" levels of behaviourial dependence, while a comparative 52 percent (N = 12) of nonsundowners were categorized within the "high" to "maximum" levels of behaviourial dependency. Moreover it was found that none of the sundowners fell within the categories that represented complete "independence" and/or "low" levels of behaviourial dependence, while 22 percent (N = 5) of nonsundowners were categorized as behaviourially independent or minimally dependent. Chi-Square analyses confirmed that groups were significantly

different in terms of the distribution of levels of behaviourial dependence, with low and high levels being unevenly distributed across groups, χ^2 (1, 37) = 6.80, $p < .05$. These results underscore the contention that sundowners and nonsundowners are significantly different, in terms of their ability to function independently. Graphic representation of sundowners and nonsundowners on their differing levels of behaviourial dependence can be seen in Figure 2.

Figure 2

Number of Sundowners and Nonsundowners Displaying Different Levels of Behaviourial Ability, from Low to High Levels of Behaviourial Dependence



Finally, in terms of individual subtests of behaviourial functioning, differentiation between groups on category of function was also seen. For sundowners, 87 percent (N = 20) experienced "high" to "maximum" levels of apathy (measured by degree of socializing, helping out, keeping self occupied, willingness to things suggested) while only 26 percent (N = 6) of nonsundowners experienced similar levels of difficulty. Instead 30 percent (N = 7) of nonsundowners fell into the "zero" to "mild" ranges of apathy, while only 4 percent (N = 1) of sundowners did similarly. Analyses of these findings indicated that groups were significantly different in their distribution of levels of apathy, with high and low levels unevenly distributed across the groups, χ^2 (1, 34) = 10.75, $p < .05$. In terms of communication difficulties (measured by communication both to and with others), 52 percent (N = 12) of sundowners and 26 percent (N = 6) of nonsundowners experienced "high" to "maximum" difficulties, while 48 percent (N = 11) of sundowners and 74 percent (N = 17) of nonsundowners experienced "no" communication difficulties. Regarding social disturbance (measured by evidence of loudness or

constant talking, pilfering, interfering with others, objectionable and/or accusatory behaviours, hoarding), 74 percent (N = 17) of sundowners and a comparative 43 percent of nonsundowners (N = 10) fell within the "high" to "maximum" levels of disturbance, while 48 percent of nonsundowners and only 26 percent of sundowners (N = 6) were classified similarly. Finally, 61 percent (N = 14) of sundowners and a relative 48 percent (N = 11) of nonsundowners were rated to possess high to maximum physical disabilities, while 35 percent of nonsundowners (N = 8) and 17 percent of sundowners (N = 4) were characterized within the "zero" to "mild" ranges of physical disability. Subsequent Chi-Square analyses of these latter three behaviourial subtests showed no significant differences between groups, in distribution of levels of difficulty.

Hypothesis 3

Sundowners and nonsundowners from a dementing elderly population differ in terms of auditory capacities, as measured by pure tone thresholds and speech discrimination. It has been hypothesized that sundowners will show greater impairment in high frequency hearing and speech discrimination, but show

comparable abilities for low and middle frequency hearing.

Pure Tone Thresholds

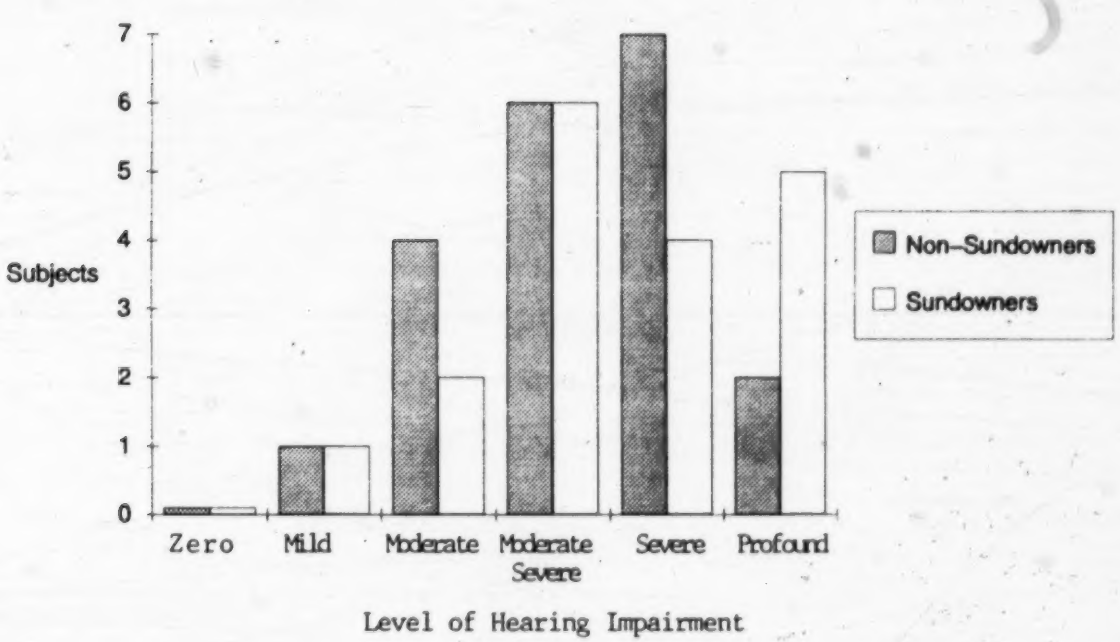
Multiple measures of auditory functioning were acquired for groups, with results including the hearing ability of groups across the low, middle and high frequency ranges. While it was not expected that sundowners and nonsundowners would differ on overall auditory abilities when the right and left ears were combined, it was likewise not expected that they would differ when the low, middle, and high frequency levels of hearing were all considered together. Results of a MANCOVA concurred with these contentions, and demonstrated non-significant group differences, $F(3,33) = .05989$, $p < .583$.

Secondly, individual examinations of auditory capacities within the low, middle and high frequency ranges were completed. This provided some, albeit not complete support for the researcher's expectations, that sundowners and nonsundowners would be comparable on low and middle frequency hearing, but different on high frequency hearing. Like hypothesized no differences were found between sundowners and

nonsundowners on low frequency hearing, when age was controlled for statistically (F (2, 35) = .007, p < .932). Similarly, results supported the researcher's expectations by demonstrating that groups did not differ on capacities for middle frequency hearing, F (2, 35) = .146 p < .704. In terms of high frequency hearing however it was hypothesized that sundowners and nonsundowners would differ, and that the sundowners would demonstrate the greatest impairment. Results did not support this, with an ANCOVA showing no group differences on hearing capacities within the high frequency range, F (2, 35) = 1.015, p < .321. Graphic representation of groups according to high frequency hearing is illustrated in Figure 3.

Figure 3

Number of Sundowners and Nonsundowners Experiencing Different Levels of High Frequency Hearing Impairment, from No Hearing Loss (0) to Profound Hearing Loss (5)



The classification of sundowners and nonsundowners according to actual degree of hearing loss in the low, middle and high frequency ranges can be seen in Table 3. The classification system is representative of the standards used by the American National Standards Institute (1969) (Katz and White, 1982), and results illustrate that both sundowners and nonsundowners experience impairments. While impairments were expected given the auditory losses that occur naturally with age and with dementing illness, findings emphasize that regardless of group differences, difficulties are evident for both groups in auditory functioning. This was particularly evident when hearing abilities within the high frequency range were examined, with results consistent with what would be expected from the impact of normal physiological aging. The process of normal aging has its greatest impact upon auditory abilities within the high frequency range (Hull, 1982; Marshall, 1981; Martin, 1981).

Table 3

Comparison of Sundowners (S) and Nonsundowners (NS) on Pure-Tone Air Conduction in the Low, Middle, and High Frequency Ranges, according to Level of Impairment

Impairment in Decibel units (db)	Level of Frequency in Hertz units (Hz) Low	Middle	High (db)
Profound	--	--	28% (S)
90+ db	--	--	10% (NS)
Severe	--	--	22% (S)
70-89 db	--	5% (NS)	35% (NS)
Moderate to	--	28% (S)	33% (S)
Severe	15% (NS)	10% (NS)	30% (NS)
55-69 db			
Moderate	17% (S)	22% (S)	11% (S)
40-54 db	10% (NS)	25% (NS)	20% (NS)
Mild	61% (S)	39% (S)	6% (S)
25-39 db	45% (NS)	30% (NS)	5% (NS)
Normal	22% (S)	11% (S)	--
0-24 db	30% (NS)	30% (NS)	--

As can be seen from Table 3, 30 percent of nonsundowners (N = 6) and 22 percent of sundowners (N = 4) fell within the "normal" range on low frequency hearing (250-500 Hz). Further, a total of 83 percent of sundowners (N = 15) and 75 percent of nonsundowners (N = 15) fell within the "normal" to "mild" ranges of low frequency hearing loss combined, indicating that in general, both groups show minimal impairments in this area. Similarly, in terms of middle frequency hearing (1000-2000 Hz), 28 percent of sundowners (N = 5) and 15 percent of nonsundowners (N = 3) fell within the "moderate to severe" and "severe" categories of impairment, while 22 percent of sundowners (N = 4) and 25 percent of nonsundowners (N = 5) were classified as "moderately" impaired, and 50 percent of sundowners (N = 9) and 60 percent of nonsundowners (N = 12) were classified within the "mild" to "normal" ranges of impairment combined. In terms of high frequency hearing however greater impairment was evident across both the groups, and groups were comparable on level of impairment. Findings showed that no sundowners or nonsundowners were classified within the "normal" range of high frequency hearing, and only 6 percent of

sundowners (N = 1) and 5 percent of nonsundowners (N = 1) were classified with "mild" hearing impairment. Rather, 11 percent of sundowners (N = 2) and 20 percent of nonsundowners (N = 4) fell within the "moderate" range of high frequency impairment, 56 percent of sundowners (N = 10) and 65 percent of nonsundowners (N = 13) were classified as "moderately to severely" and "severely" impaired, and 28 percent of sundowners (N = 5) and 10 percent of nonsundowners (N = 2) experienced "profound" high frequency hearing loss.

Speech Discrimination

In terms of capacities for speech discrimination, results showed that when speech discrimination under quiet (right and left ears) and noisy conditions were considered together, no differences between the groups were found. Results of a MANCOVA showed sundowners and nonsundowners to be comparable, when age was controlled for statistically, F (3, 31) = .10040, $p < .39$.

While it appears that capacities for speech discrimination with the quiet and noisy conditions considered together were not different between groups, examination of descriptive statistics provided information on the actual and everyday level of

function for groups. Here findings showed that while speech discrimination under quiet conditions in the left and right ears were adequate and not highly debilitating, speech discrimination under noisy conditions were more problematic. Specifically it was found that sundowners and nonsundowners comprehended the messages and words conveyed to their left ears in quiet conditions quite adequately, and recalled 68.94 percent ($\underline{s}$ = 25.79) and 84.0 percent ($\underline{s}$ = 15.08) of the words respectively. Further, when messages and words were conveyed to their right ears under quiet conditions, sundowners and nonsundowners comprehended 72.94 percent ($\underline{s}$ = 27.19) and 86.5 percent ($\underline{s}$ = 18.29) of words respectively--again suggestive of minimal impairment to communication. However greater impairments in ability to communicate effectively were seen when capacities for speech discrimination under noisy conditions were examined, with impairments being noted for both groups. Here it was found that sundowners were only able to comprehend and repeat on average 50.23 percent ($\underline{s}$ = 26.83) of the words/messages conveyed to them. In comparison the nonsundowners were able to comprehend and repeat on average 67.37 percent

($\underline{s}$ = 19.78) of the same.

Finally the capacities for speech discrimination under noisy conditions were examined exclusively, with the comparison between sundowners and nonsundowners made. Here it was found that the groups did not differ as hypothesized, with results of an ANCOVA showing non-significant group differences, $\underline{F}$ (2, 33) = 2.92, $\underline{p}$ < .097. It is noted however that had all the subjects who were intended for inclusion in the study (particularly sundowners) successfully completed speech discrimination testing, different results might have been found. It should be noted that 17 percent of nonsundowners ($\underline{N}$ = 4) and 26 percent of sundowners ($\underline{N}$ = 6) did not complete the speech discrimination assessment, with the majority of excluded sundowners described by nursing staff to be quite impaired on auditory abilities.

To this point, it has been hypothesized that sundowners and nonsundowners would differ on cognitive and behaviourial functioning, and on high frequency hearing and speech discrimination. As a result, a further analyses utilizing all of these variables was completed. Results of this revealed that when the

cognitive, behaviourial, and auditory variables were all weighted and compared together statistically, differences between the groups were evident. In particular it was found that as a group the sundowners showed the greatest overall impairment. Accordingly, results of a MANOVA produced the following findings, $F(10, 25) = 1.026$, $p < .027$, indicative of significant overall group differences.

Hypothesis 4

Sundowners and nonsundowners from a dementing elderly population differ in the frequency of psychosocial changes in their immediate environment. It has been hypothesized that sundowners will have experienced greater numbers of roommates being transferred into and/or out of their rooms in the month prior to study, and will have experienced greater numbers of relocations within the ward and/or hospital in the month prior to study.

In this facility it was found that as a group both the sundowners and nonsundowners had experienced transfers of roommates and/or relocation of themselves, in the month prior to study. Indeed it was found that six or 26 percent of sundowners had experienced one or

more relocations in the month prior to study, while a comparable four or 17 percent of nonsundowners had experienced the same. Results of analyses showed that although both sundowners and nonsundowners had experienced these psychosocial changes in the month prior to investigation, the frequency of relocations were comparable between groups. Findings from an ANOVA showed non-significant group differences, F (1, 44) = .494, $p < .486$.

In terms of other psychosocial changes, results showed that both groups contained subjects who had experienced a roommate transfer in the month prior to investigation. Examination revealed that 52 percent (N = 12) of sundowners had experienced the transfer of a roommate either into or outside of their respective rooms, while only a comparative 26 percent (N = 6) of nonsundowners had experienced a roommate transfer Chi Square analyses showed that in fact the groups differed significantly, with transfers being unevenly distributed between groups, χ^2 (1, N = 46) = 9.86, $p < .01$. Results illustrated that sundowners and nonsundowners were different in their distribution of transfers within the month prior to study, supporting

the researcher's hypothesis that they would differ on psychosocial factors/changes.

Hypothesis 5

Sundowners and nonsundowners selected from a dementing elderly population differ in the use of prescribed psychotropic medications. It has been hypothesized that sundowners will show greater overall use of prescribed psychotropic medications, and show greater use of medications which possess anticholinergic properties.

Of the psychotropic medications examined, sundowners and nonsundowners were both prescribed with a variety of different drug classifications. Medications included different antipsychotics, anticonvulsants, antidepressants, sedative-anxiolytics, sedative-hypnotics, antiparkinsonian medications, and mood stabilizers. Examination of these revealed that 83 percent (N = 19) of sundowners and 65 percent (N = 15) of nonsundowners were on one or more antipsychotics, 17 percent (N = 4) of sundowners and 9 percent (N = 2) of nonsundowners were on one or more anticonvulsants, 4 percent (N = 1) of sundowners and 22 percent (N = 5) of nonsundowners were on an

antidepressant, and 17 percent (N = 4) of sundowners and 9 percent (N = 2) of nonsundowners were on one or more sedative-anxiolytics. Further, 26 percent (N = 6) of sundowners and 48 percent (N = 11) of nonsundowners were on one or more sedative-hypnotics, 13 percent (N = 3) of sundowners and 9 percent (N = 2) of nonsundowners were on an antiparkinsonian agent, and zero percent of sundowners and 4 percent (N = 1) of nonsundowners were on a mood stabilizer. Statistical analyses revealed that when a MANOVA was undertaken to weight and compare these medication types together, no overall group differences were found, F (7, 38) = .27973, $p < .191$. Closer examination revealed however that when medication types were compared individually, groups differed on their use of antipsychotics. Statistical analyses demonstrated that sundowners had been prescribed with greater numbers of antipsychotic drugs, relative to their nonsundowner comparisons, t (44) = 1.85, $p < .05$.

In terms of the actual number of prescribed medications given to subjects, results showed no significant differences between groups. It was found that the number of prescribed psychotropic medications

for sundowners ranged between zero and five, with the mean number of medications being 1.96 (*s* = 1.26). For nonsundowners it was found that the number of prescribed psychotropic medications ranged between zero and three, with the mean number of medications being 1.70 (*s* = .82). Subsequent analyses confirmed that the groups were comparable, refuting the researcher's hypothesis for group differences, *t* (44) = .83, *p* < .410. A presentation of these findings can be found in Table 4.

Table 4

Comparison of Use of Prescribed Psychotropic Medications in Sundowners and Nonsundowners

Group	M	S.D.	t	df	p
Sundowners	1.96	1.26			
Nonsundowners	1.70	.82			
			.83	44	.410 N.S.

Finally, when the medications were examined for their degree of anticholinergic properties, the following results were obtained. It was found that 61 percent (N = 14) of sundowners and a comparable 65 percent (N = 15) of nonsundowners had been prescribed with a single medication that possessed "moderate" to "high" anticholinergic effects. Further, that 42 percent (N = 5) of sundowners and 15 percent of nonsundowners (N = 2) had been prescribed with two or more medications, each of which possessed the same degree of "moderate" to "high" anticholinergic properties. Upon statistical analyses it was found that the groups did not show significant differences, when the overall degree of anticholinergic effects was examined, t (44) = 1.01, p < .318. Findings revealed that in total the sundowners showed a mean value of 2.57 (s = 2.332) for cholinergic effects, that was best characterized by the upper end of the "moderate" range for anticholinergic properties. In comparison the nonsundowners showed a mean value of 2.0 (s = 1.31) for cholinergic effects, which was best characterized by the lower end of the "moderate" range for anticholinergic properties. In summary, a comparison

of the use of medications with anticholinergic effects between groups showed non-significant differences, refuting the researcher's hypothesis.

V. DISCUSSION

Discussion and Commentary on Results

Understanding the dynamics of sundown syndrome in a dementing elderly population requires a multidimensional perspective. While investigation of single factors may provide valuable insights into its development, they may at the same time obscure meaningful differences that exist between sundowners and nonsundowners. Until recently sundown syndrome has been a relatively unknown and unstudied phenomenon, and as such the factors important in its development, amelioration, and prevention have been unknown. It has been found in this study however that through systematic and repeated investigations sundown syndrome can be identified in a psychogeriatric population, and that sundowners and nonsundowners can be differentiated on clinically meaningful factors.

The results of this study demonstrate that differences exist between sundowners and nonsundowners in a dementing elderly population, and that sundowners experience greater degrees of impairment in important areas of functioning. In particular they show that elderly persons with sundown syndrome experience

significantly greater impairments in cognitive functioning, and that this is so regardless of whether subjects are examined in the morning, or rather in the afternoon, when the impact of deterioration across the day is most evident. Findings also show that elderly persons with sundown syndrome are more impaired in behaviourial functioning, and all of these results are consistent with the findings and expectations reported by researchers in the past (Beel-Bates and Rogers, 1990; Bliwise, Carroll, and Dement, 1989; Cohen-Mansfield, Watson, Meade, Gordon, Leatherman, and Emor, 1989; Evans, 1987; Forbes, Hopkins, Hamilton, and Carter-Dickson, 1981; Stewart, Hiscock, MacBeath, and Richardson, 1986). Accordingly the findings in this study showed that a high percentage of sundowners fell within the marked to severe ranges of cognitive impairment, and within the high to maximum levels of behaviourial dependence. In comparison greater numbers of nonsundowners fell within the mild range of cognitive impairment, and in the lower levels of behaviourial dependence. The findings have demonstrated that sundowners experience greater difficulties in orienting themselves and communicating

effectively in their environments, that they experience greater difficulties with psychomotor function, and that they demonstrate greater levels of apathy. Furthermore it has been found that sundowners demonstrate greater levels of social disturbance in their environments, which was not unexpected given the symptoms that have been reported to be associated with sundown syndrome.

Given these findings, it appears that greater impairments in mental and behaviourial abilities are in some way related to the development of symptoms associated with sundown syndrome. Perhaps too, greater impairments in mental and behaviourial abilities are related to the development of the syndrome itself. It may be that the greater cognitive and behaviourial deficits experienced by dementing elderly persons put them at risk for the syndrome, by impacting even more negatively on their already limited and dwindling capacities to cope with the environment and its stressors. It is reasonable to propose that as the day progresses a person with significant mental deficits has even lesser capacities to cope effectively, which could explain the development of symptoms associated

with sundown syndrome--increased restlessness, agitation, and confusion (Cohen, 1978; Hall, 1988; Hall and Buckwalter, 1987; Hall, Kirschling, and Todd, 1986; Lawton and Nahemow, 1973; Norris, 1986; Selye, 1980; Zuckerman, 1969). It could also help to explain the greater levels of apathy and social disturbance that have been demonstrated by sundowners in this study, in that greater deficits and confusion could lead to lesser willingness and confidence to engage in different activities and social events. Further, greater cognitive deficits and confusion may in part help to explain the greater wandering and verbal behaviours that were evidenced--symptoms that are associated with sundown syndrome.

Based on these results, investigations of cognitive and behaviourial abilities in this population are important. This will enable researchers and clinicians to identify cases of severe impairment and disability, and to pinpoint possible risk cases for sundown syndrome. While not all dementing elderly persons who possess marked cognitive and behaviourial deficits wi[illegible]nevitably develop sundown syndrome, results suggest that monitoring for the same might

prove valuable. It will also be important to be aware of other difficulties that are experienced by these individuals, which may only serve to further impact upon their already limited coping capacities.

The results obtained in this study have also illustrated that as a whole, auditory capacities do not differ between the sundowners and nonsundowners, at least not in this population. While results demonstrate that group differences are evident when cognitive, behaviourial, and auditory functioning (high frequency hearing and speech discrimination) are considered together, subsequent analyses of overall hearing ability do not show group differences. Rather the results indicate that sundowners and nonsundowners are comparable on low, middle, and high frequency hearing, and comparable on speech discrimination under quiet and noisy listening conditions. It must be remembered however that not all of the subjects were assessed for the latter (speech discrimination) due to their resistiveness and/or untestability (and for one nonsundowner an early discharge from hospital), and indeed the majority of untested sundowners were considered by nursing staff to be quite impaired on

auditory abilities. It remains possible therefore that further investigations of sundown syndrome using greater numbers in this population would find group differences on speech discrimination in noise. Certainly greater deficits for sundowners in ability to understand instructions and communications in the environment could in part explain the increase in confusion and disorientation as the day progresses, recognizing as well that dementing persons have decreased capacities to cope with multiple stressors/stimuli as the day develops (Hall, 1988; Hall and Buckwalter, 1987; Norris, 1986). It has in fact been proposed that auditory difficulties are in and of themselves highly stressful, and as such can exacerbate one's already limited coping capacities. It remains possible that auditory difficulties in this population put persons at greater risk for confusion and disorientation, and at risk for other dysfunctional behaviours--not unlike those associated with sundown syndrome (Abend and Chen, 1985; Gough and Semple, 1989; Lipowski, 1983; Weinstein, 1989).

Despite evidence that sundowners and nonsundowners do not in this population differ on overall auditory

abilities, it is important to recognize that both groups demonstrated significant impairments. This was found to be particularly evident on high frequency hearing and speech discrimination, which should not be considered unusual given what we know about the impact of normal physiological aging on auditory abilities. High frequency hearing and speech discrimination abilities are the areas that are most impacted by the normal aging process, and impacted even more negatively by the effects of dementing illness (Maddox, 1987; Martin, 1981; Resnick, 1989; Rovner, 1988; Uhlmann, Teri, Thomas, Rees, Mozlowski, and Larson, 1989; Uhlmann, Thomas, Rees, Psaty, and Duckert, 1989).

Examination of the prevalence rates for auditory impairment that are reported in the literature suggests that the subjects used in this study were comparable on prevalence and degree of auditory impairment, relative to other institutionalized elderly persons (Bingea, Raffin, Aune, Baye, and Shea, 1987; Davignon and Leshowitz, 1986; Herbst, 1981; Jones, Victor, and Vetter, 1984). It is reasonable to propose therefore, that the subjects selected for this study were at risk for the other difficulties that are reported to be

associated with hearing impairment. These difficulties include impairment in comprehension and communication, increased social isolation and withdrawal, decreased ability to orient and function effectively, increased confusion and imbalance, and reduced quality of life (Bernardini, 1985; Calvani, 1985; Gerson, Jarjoura, and McCord, 1989; Hickish, 1989; Oppegard, Hansson, Morgan, Indart, Crutcher, and Hampton, 1984; Salomon, Vesterager, and Jagd, 1988). Given this, the prevalence and impact of auditory impairment in this population cannot go unrecognized, and must certainly be identified so that effective interventions can be forthcoming.

Further findings demonstrated that sundowners and nonsundowners do not differ significantly on frequency of relocations in the month prior to investigation, but differ in terms of their distribution of roommate transfers. In fact the findings illustrated that sundowners had more often experienced the disruption of a roommate transfer in the month preceding investigations, relative to the nonsundowners. It became apparent therefore that the groups were different on environmental factors/changes, and it

remains possible that this would have been even more apparent had the frequency of transfers/relocations been examined over a six month or one year period prior to investigation. A further possibility remains that groups would have shown clearer differences had the frequency of transfers/relocations been examined in the month or months that preceded the onset of sundown syndrome and non-sundown syndrome respectively. Certainly, results are consistent with the findings of Evans (1987), where psychosocial events and environmental changes were found to be important in the differentiation of sundowners and nonsundowners. Moreover, with the writings of Norris (1986), where changes in one's immediate living conditions were postulated as important in understanding the development of sundown syndrome and its symptoms. Greater transfers and environmental changes can perhaps be understood as additive stressors that are demanding of readjustment--that overwhelm a dementing person's limited coping capacities. According to supporters of the stimulus overload theory (Hall, 1988; Hall and Buckwalter, 1987; Hall, Kirschling, and Todd, 1986), sundown syndrome may be understood as a reaction to

stressors and change in the environment, that exceed a persons's threshold for coping.

Finally, the sundowners and nonsundowners used in this study were not found to differ on the number of prescribed psychotropic medications. Furthermore, despite evidence that showed the sundowners to be prescribed with greater numbers of antipsychotics, there were no overall group by medication type differences. There was also no evidence to suggest that groups differed on the degree of anticholinergic properties per prescribed medications. Although it may be that greater use of antipsychotics by the sundowners in some way contributed to development of the syndrome, it remains equally plausible that antipsychotics were prescribed in greater numbers to those who displayed more disruptive and disturbed behaviours--like those exhibiting sundown syndrome. The findings have demonstrated that the prescribed use of such medications will require further investigations, particularly in regard to the onset of the syndrome and the commencement of prescribed medications.

The incidence of psychotropic drug prescriptions for sundowners and nonsundowners in this study was

consistent with the figures reported for other elderly persons in long-term care institutions, like the Alberta Hospital. Incidence of drug prescriptions have been reported between 7 and 92 percent for the institutionalized elderly (Salzman, 1982a), and sundowners and nonsundowners in this study clearly fell within that range. In terms of the actual numbers of prescribed psychotropic drugs however, results suggested that both groups were on the whole taking a lesser number of prescribed drugs than that reported in the literature for similar populations. While polypharmacy has been repeatedly noted as problematic among the institutionalized elderly (Beers and Ouslander, 1989; Lamy, 1984), results indicated that it was less evident for the subjects in this study. Sundowners and nonsundowners in this study were prescribed with slightly less than two psychotropic medications on average (mean values of 1.96 and 1.70 for sundowners and nonsundowners respectively), and reports in the literature have indicated that most hospitalized elderly persons are on approximately four to seven medications concurrently (Ancill, Embury, MacEwan, and Kennedy, 1988; Nolan and O'Malley, 1988;

Nolan and O'Malley, 1989b). These statements suggest therefore that the number of psychotropic medications prescribed for subjects in this study was conservative, and may in part account for the non group differences that were found for medication frequencies and for overall anticholinergic effects. Further investigations of the use of medications in other populations where sundown syndrome is evident may however reveal important differences between sundowners and nonsundowners, and more detailed investigations of the use of medications in this population may reveal fundamental group differences. Length of time on different psychotropic medication may also provide insights into the differentiation of sundowners and nonsundowners, and examination of the dosage levels and the time of usage may reveal meaningful group differences.

The findings of this study have demonstrated support for the existence of sundown syndrome in a psychogeriatric population, and have revealed information about a clinical phenomenon that has to date been largely unstudied and misunderstood. Results have provided information on factors that appear to be

important in the differentiation of sundowners and nonsundowners, and have contributed to a broader knowledge base from which to respond and intervene.

Results suggest that the assessment of cognitive and behaviourial functioning and the assessment of environmental changes/disruptions (roommate transfers) in elderly persons with and without sundown syndrome is important. Moreover, that in part, the assessment of auditory capacities in psychogeriatric populations may be important. While results indicate that auditory abilities do not as a whole contribute to the development or understanding of sundown syndrome like that of cognitive and behaviourial abilities, hearing impairments can undoubtedly lead to dysfunctional behaviours like those seen in the syndrome. Given this, until the role of auditory impairment in sundown syndrome can be investigated further with greater numbers and other populations, assessment for intervention and amelioration purposes remains important.

While factors that are important and of potential importance in differentiating sundowners from nonsundowners in a psychogeriatric population have been

identified, it is important to emphasize that each of these factors alone does not unequivocally equal sundown syndrome. Furthermore, in combination these factors do not inevitably lead to the development of the syndrome, and it would be inaccurate to state that in combination they adequately explain the factors that put one at possible risk for sundown syndrome. As of yet much is still unknown about the complex clinical phenomenon referred to as sundown syndrome, and accordingly, continued investigations are warranted. The factors that have been identified and investigated in this study require further examinations, and given the debilitating impact that sundown syndrome can have on those who already experience the tragedies and disabilities of dementing illness, these factors necessitate serious and immediate attention.

Implications for Practice

A primary implication arising from the results of this study is that sundown syndrome exists in psychogeriatric populations. Further, that an unknown percentage of demented elderly persons may ultimately be at risk for its development. In the end this may mean greater levels of institutionalization for those

who already reside in a care facility, and/or institutionalization of persons from their homes, due to the behaviourial disturbances and symptoms that are associated with its occurrence.

Results in this study suggest that there are factors which tend to be associated with sundown syndrome, in that they differentiate sundowners from nonsundowners who have been similarly diagnosed. It has been found for example that cognitive functioning is clearly different between the groups, and not merely a function of deterioration which develops across the day. Furthermore, that behaviourial functioning is different between groups, with the sundowners showing the greatest impairment. These findings suggest therefore that different levels of care and different intervention approaches will be needed when working with various individuals and groups, and that expectations must be established at reasonable levels. This will allow patients to function at their optimal levels, without becoming further frustrated and impaired, due to unreasonably high caretaker expectations. Findings suggest that if we know that sundowners tend to experience and demonstrate greater

cognitive and behaviourial difficulties, practitioners can be aware of the same in their patient interactions, and be aware of the potential for its development in dementing persons with high levels of impairment.

Given the findings presented and the knowledge we have to this point attained, it is reasonable to suggest that practitioners can learn to reliably identify those with sundown syndrome in a psychogeriatric population. In achieving this practitioners can then actively intervene using a calm and supportive manner as the day progresses, and as the symptoms that are associated with the syndrome become more apparent. Such an interventive approach may in turn serve to minimize or offset any further dysfunction that could arise.

If we are aware of the factors that in some way contribute to sundown syndrome, interventions by care providers can potentially be more effective. Practitioners can assist in the alteration and design of patients' immediate environments, so that the difficulties that are associated with impairments can be minimized. Further, since we do not yet know whether symptoms exacerbate even further from their

onset in late afternoon to their disappearance in later evening, practitioners can monitor for the same, with the possibility that early interventions may minimize the exacerbation of symptoms. Finally, given our knowledge that coping capacities decline markedly as the day progresses for dementing elderly persons (Hall, 1988; Hall and Buckwalter, 1987; Stewart, Hiscock, MacBeath, and Richardson, 1986), environmental interventions might serve to offset further decline and impairment. Since it has been found that the transfer of roommates is in some way associated with sundown syndrome and its symptomatology, minimization of environmental disruptions may prove to be helpful. Additionally, removal from areas with additive stimuli and noise/confusion are recommended--particularly as the development of sundowning syndrome across the day becomes evident and/or expected.

In terms of information that was obtained regarding the auditory capacities of sundowners and nonsundowners, findings suggest that regardless of group comparability or difference, interventions by care providers can prove meaningful and effective. Dementing persons as a whole experience marked deficits

in high frequency hearing and speech discrimination, particularly under difficult listening conditions that are not dissimilar to the listening conditions found in the hospital (Forbes, 1984; Marshall, 1981; Miller, 1980; Rudmin, 1983). Given this, the possibility for confusion, disorientation, frustration, social isolation, and marked communication and comprehension difficulties exists for these patients, and practitioners can be of assistance. Practitioners can make consistent efforts to communicate with patients as directly and clearly as is possible, and speak directly to their faces so that lips are visible. Further, since high frequency hearing is known to be particularly problematic, many sounds will be distorted and fuzzy, and indeed, certain speech sounds will be completely inaudible (Hull, 1982; Marshall, 1981; Pickett, Bergman, and Levitt, 1979; Rudmin, 1983). Communication will therefore be optimized when the listening environment is not filled with additive distractions and auditory stimuli, and when background noises are diminished. Communication will also be enhanced when communicators speak in low tones to allow for the loss of ability to hear high frequency sounds,

and when speakers utilize such strategies as visual and written cues and gesturing in their communications. Further, when extended time is allowed for elderly persons to process the information conveyed to them, and when communicators accept non-verbal cues from the patient as an integral aspect of expression (Bernardini, 1985; Shulman, and Mandel, 1988). Utilization of these communication strategies may to some degree offset the existent hearing difficulties, that potentially serve to further confuse and frustrate the patients, increase their level of stress, and overwhelm their already dwindling coping capacities.

In summary, if practitioners make concerted efforts to respond and intervene in any of the ways recommended, it is possible that the impairments and associated stressors experienced by patients with dementing illness and sundown syndrome may be minimized. Furthermore, it is then possible that the level of function and quality of life for these persons can be maximized.

Implications for Further Research

The results of this study have served to further our knowledge base and understanding of sundown

syndrome. Factors which are important in differentiating sundowners from nonsundowners in a dementing elderly population have been delineated, and in accordance, information regarding potentially effective interventions and treatment planning have been obtained. The findings do not in any way however provide us with a comprehensive understanding of this complex phenomenon, and it follows therefore that further investigations are needed.

The generalizability of these findings has in part been limited by the nature of the institution and the patient population utilized. While results of cognitive and behaviourial assessments are consistent with the findings and expectations of researchers in the past, further investigations which utilize more diverse patient populations and levels of institutionalization are recommended. Although it is recognized that the prevalence of sundown syndrome in patients with less impairment and who reside in lower levels of institutionalization may not be as great as that found in this study, it will be important to determine whether fundamental differences exist between sundowners residing in different levels of care and

with different degrees of impairment. Further investigations carried out in nursing home environments, psychogeriatric units in urban and rural hospitals, auxiliary homes, long-term care facilities, and so forth, are recommended.

Given the population utilized in this study, advanced levels of cognitive impairment were evident. As a result it was found that many patients who were initially rated by nursing staff as sundowners were untestable, at least using the measures that were planned for this study. In fact it was found that 16 out of 51 patients (31 percent) who were identified as potential sundowners were excluded due to untestability, with 11 of these 16 (69 percent) excluded due to advanced cognitive impairment. It was found that by utilizing the Kingston Dementia Rating Scale (KDRS) (Lawson, Rodenberg, and Dykes, 1977) to measure change in functioning across the day, the detection of variation in these highly impaired patients was impossible. Typically these subjects obtained maximum scores on the KDRS in both morning and late afternoon, which interfered with the researcher's ability to accurately identify sundown syndrome.

In terms of the other patients who were rated by nurses as potential sundowners but who were not in the end included, 3 out of these 16 (or 19 percent) were excluded due to their aggressive/threatening and/or wandering behaviours. The behaviours that were demonstrated by these patients interfered dramatically with the possibility of complete testing, and as a result these patients were not assessed in any way. It would however have been interesting to monitor the behaviours of all the potential sundowners that were eliminated, even if observations had been informal. Observations could have delineated whether such behaviours as wandering and verbal threats showed change across the day, or whether they remained relatively stable. Monitoring of these behaviours would have determined whether wandering behaviours increased in late afternoon to early evening for these patients, and whether verbal threats and aggressiveness increased as the day progressed. Similar observations are thereby recommended for future researchers, even in patients who are believed to be potential sundowners but do not present as ideal candidates for formal assessment. It is also recommended that future

researchers utilize and develop measures that are sensitive to the detection of change in functioning across the day, particularly in persons with advanced cognitive impairment. The sample size and the subjects utilized in this study were certainly limited by the instruments that were selected to identify sundown syndrome, as they were not sensitive enough to detect diurnal change in patients who already demonstrated severe impairment and organic dementia.

In terms of the results that were obtained regarding the behaviourial functioning of subjects, findings were in part limited by the nature of the Behaviour Rating Scale selected (Pattie and Gilleard, 1983). Subjects were rated by their nurses on overall level of behaviourial functioning, but not rated on change of behaviourial functioning across the day. Given the nature of sundown syndrome it would seem that observation and monitoring across the day is warranted, to determine whether such behaviours as communication and degree of socialization, confusion on the ward, involvement in activities, apathy, wandering, social disturbance and objectionable behaviours, remain stable, whether they increase as might be expected

across the day, or rather, whether some of the behaviours decrease as the day progresses. Use of behaviourial observations like those used by other researchers could provide important insights into the manifestation of sundown syndrome across the 24 hour circadian cycle, rather than rely on overall ratings of behaviourial function that are taken at one time alone.

Finally the results obtained on capacities for speech discrimination suggest that further investigations of auditory ability are warranted. Given that not all subjects in either group were able to complete the full auditory assessment and that nursing staff described the untestable sundowners as markedly impaired in auditory abilities, the possibility that sundown syndrome is in some way related to auditory impairment remains. Furthermore, results suggest that future investigations of environmental and psychosocial factors (roommate transfers and relocations) are important, particularly since the findings showed groups to be different on distribution of roommate transfers/environmental disruptions in the month prior to investigation. Given what we know about the potential debilitating effects

of auditory impairments and additive changes/environmental stressors on the coping and functional capacities of dementing elderly persons (Cohen, 1978; Eastwood, Corbin, and Reed, 1981; Eastwood, Corbin, Reed, and Kedward, 1984; Hall, 1988; Hall and Buckwalter, 1987; Rosch, 1987; Weinstein, 1989), further investigations are critical. Identification and subsequent intervention with both environmental stressors and changes and with auditory impairments, may in the end offset any further debilitation, and promote an optimal level of functioning.

Concluding Statement

The ability to understand and identify factors that are important in the existence and development of sundown syndrome is to be welcomed. While the results of this study have delineated factors which meaningfully differentiate sundowners from nonsundowners in a psychogeriatric population, our knowledge about sundown syndrome is still limited. The factors that are of fundamental importance in its development are as a result not yet clear.

As researchers continue to investigate the

dynamics of sundown syndrome it is hoped that further insights regarding development and treatment can be attained. Moreover, that instruments for its identification and assessment can be constructed and revised. It is believed that through this, practitioners and care providers will be better able to intervene in a phenomenon that can unfortunately lead to greater levels of care and institutionalization for demented elderly persons. It is hoped, that with greater knowledge and understanding, practitioners will be more able to intervene in a phenomenon that creates additive confusion and disability, in those who are already significantly impaired. Through this, it is ultimately hoped that we will in the end be better able to enhance and potentiate level of functioning and quality of life.

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Appendix A

Kingston Dementia Rating Scale

KINGSTON DEMENTIA RATING SCALE

I. Orientation

1. Orientation to Place

"Where are you now?" (If patient fails to reply or gives an irrelevant reply, ask "Are you in a school, a church, a hospital, or a house?" Only the response "hospital" earns a zero score.)

Response: _____ Score: _____

2. Orientation to People

(Point to a staff member and ask, "Does that person work here?" Then point to a patient and ask, "Does that person work here?" Both questions must be correct to receive a zero score.)

Response 1 (staff) _____ Score: _____
Response 2 (patient) _____ Score: _____

3. Orientation to Year

"What year is this?"

Response: _____ Score: _____

4. Orientation to Month

"What month is this?"

Response: _____ Score: _____

5. Orientation to Day of Week

"Which day of the week is this?" (i.e. Monday? Tuesday?)

Response: _____ Score: _____

6. Orientation to Time of Day

"What time is it now?" (Patient must be accurate within 90 minutes to receive a score of zero.)

Response: _____ Score: _____

7. Orientation to Inside Surroundings

"I want you to show me where your washroom is." (Patient must be able to clearly direct rater to the washroom for a zero score.)

Response: _____ Score: _____

8. Orientation to Own Age

"How old are you?"

Response: _____ Score: _____

9. Wandering

(Patient roams aimlessly through the ward as if lost or looking for something.)

Score: _____

10. Inaccurate Reporting of Events

Score: _____

Sub-Total (Orientation) _____

II. Emotional Control

11. Emotional Lability

(Inappropriate or unpredictable sudden changes in the patient's emotional state.)

Score: _____

12. Aggression

(Physical striking only)

Score: _____

Sub-Total (Emotional Control) _____

III. Language

13. Inability to Write Own Name

(Use back of sheet and ask for first and last names. Must be completed in one minute)

Score: _____

14. Linguistic Expression

(Must be able to identify a pencil, key, shoe, and thumb.)

Score: _____

15. Understanding Written Language

(Must be able to read and understand the sentence "He shouted for help.")

Response: _____

_____ Score: _____

16. Understanding Spoken Language

(Must be able to understand the sentence "The room was filled with smoke.")

Response: _____

_____ Score: _____

17. Verbal Repetition

Example: _____ Score: _____

Sub-Total (Language) _____

IV. Items 18-21

18. Dressing

Score: _____

19. Incontinence

(Incontinent of urine of feces during the day - but not "inappropriate voiding".)

Score: _____

20. Motor Restlessness Score: _____

21. Hoarding Score: _____

Sub-Total (Items 18-21) _____

Grand Total (Items 1-21) _____

Appendix B

Cognitive Assessment Scale

CLIFTON ASSESSMENT PROCEDURES FOR THE ELDERLY (CAPE)

Cognitive Assessment Scale

Name: _____
Current address/placement: _____
_____
Date of Birth: _____ Occupation: _____

Information/Orientation

Name:
Age:
Date of Birth:
Ward/Place:
Hospital/Address:
City:
Prime Minister:
U. S. President:
Colour of British Flag:
Day:
Month:
Year:

Score: _____

Mental Ability

Count 1-20 Time: _____ Errors: _____

≤ 10 secs - no errors	3
≤ 30 secs - no errors	2
≤ 30 secs - 1 error	1
	0

Alphabet Time: _____ Errors: _____

≤ 10 secs - no errors	3
≤ 30 secs - no errors	2
≤ 30 secs - 1 error	1
	0

Write name

Correct and legible	2

Writes incorrectly	1
Not able to	0

Reading (Using Reading List of 14 Words)

10 Words or more	3
6-9 Words	2
1-5 Words	1
0 Words	0

Score: _____

Psychomotor (Using Maze Apparatus for Copying)

Time: _____ Errors: _____

Score: _____

Total Score: _____

Appendix C

Behaviour Rating Scale

CLIFTON ASSESSMENT PROCEDURES FOR THE ELDERLY (CAPE)

Behaviour Rating Scale

Name: _____
Date of Birth: _____
Current Address/Placement: _____
_____

Please ring the appropriate number for each item

1. When bathing or dressing, he/she requires:

   - no assistance 0
   - some assistance 1
   - maximum assistance 2

2. With regard to walking, he/she:

   - shows no signs of weakness 0
   - walks slowly without aid, or uses a stick 1
   - is unable to walk, or if able to walk, needs frame, crutches or someone by his/her side 2

3. He/she is incontinent of urine and/or faeces (during day or night):

   - never 0
   - sometimes 1
   - almost always 2

4. He/she is in bed during the day (bed does not include couch, settee, etc):

   - never 0
   - sometimes 1
   - always 2

5. He/she is confused (unable to find way around, loses possessions, etc):

   - almost never confused 0
   - sometimes confused 1
   - almost always confused 2

6. When left to his/her own devices, his/her appearance (clothes and/or hair) is:

- almost never disorderly 0
- sometimes disorderly 1
- almost always disorderly 2

7. If allowed outside, he/she would:

- never need supervision 0
- sometimes need supervision 1
- always need supervision 2

8. He/she helps out in the home/ward:

- often helps out 0
- sometimes helps out 1
- never helps out 2

9. He/she keeps him/herself occupied in a constructive or useful activity (works, reads, plays games, has hobbies, etc.,):

- almost always occupied 0
- sometimes occupied 1
- almost never occupied 2

10. He/she socialises with others:

- does establish a good relationship with others 0
- has some difficulty establishing good relationships 1
- has a great deal of difficulty establishing good relationships 2

11. He/she is willing to do things suggested or asked of him/her:

- often goes along 0
- sometimes goes along 1
- almost never goes along 2

12. He/she understands what you communicate to him/her (you may use speaking, writing, or gesturing):

- understands almost everything you communicate 0
- understands some of what you communicate 1
- understands almost nothing of what you communicate 2

13. He/she communicates in any manner (by speaking, writing or gesturing):

- well enough to make him/herself easily understood at all times 0
- can be understood sometimes or with some difficulty 1
- can rarely or never be understood for whatever reason 2

14. He/she is objectionable to others during the day (loud or constant talking, pilfering, soiling furniture, interfering with affairs of others):

- rarely or never 0
- sometimes 1
- always 2

15. He/she is objectionable to others during the night (loud or constant talking, pilfering, soiling furniture, interfering in affairs of others, wandering about, etc.):

- rarely or never 0
- sometimes 1
- always 2

16. He/she accuses others of doing him/her bodily harm or stealing his/her personal possessions. If you are sure the accusations are true, rate zero, otherwise rate one or two:

- never 0
- sometimes 1
- always 2

17. He/she hoards apparently meaningless items (wads of paper, string, scraps of food, etc.):

- never 0

- sometimes 1
- always 2

18. His/her sleep pattern at night is:

- almost never awake 0
- sometimes awake 1
- often awake 2

Rated by: _____ Date: _____
Staff/Relative

Appendix D

Phonetically Balanced Word List 1

LIST 1

1.	an	26.	you
2.	yard	27.	as
3.	carve	28.	wet
4.	us	29.	chew
5.	day	30.	see
6.	toe	31.	deaf
7.	felt	32.	them
8.	stove	33.	give
9.	hunt	34.	true
10.	ran	35.	isle
11.	knees	36.	or
12.	knot	37.	law
13.	mew	38.	me
14.	low	39.	none
15.	owl	40.	jam
16.	it	41.	poor
17.	she	42.	him
18.	high	43.	skin
19.	there	44.	east
20.	earn	45.	thing
21.	twin	46.	dad
22.	could	47.	up
23.	what	48.	bells
24.	bathe	49.	wire
25.	ace	50.	ache

Appendix E

Phonetically Balanced Word List 2

LIST 2

1.	your	26.	and
2.	been	27.	young
3.	way	28.	cars
4.	chest	29.	tree
5.	then	30.	dumb
6.	ease	31.	that
7.	smart	32.	die
8.	gave	33.	show
9.	pew	34.	hurt
10.	ice	35.	own
11.	odd	36.	key
12.	knee	37.	oak
13.	move	38.	new
14.	now	39.	live
15.	jaw	40.	off
16.	one	41.	ill
17.	hit	42.	rooms
18.	send	43.	ham
19.	else	44.	star
20.	tear	45.	eat
21.	does	46.	thin
22.	too	47.	flat
23.	cap	48.	well
24.	with	49.	buy
25.	air	50.	ail

Appendix F

Phonetically Balanced Word List 3

LIST 3

1. carve
2. wire
3. felt
4. thing
5. knees
6. poor
7. owl
8. law
9. there
10. give
11. what
12. chew
13. as
14. twins
15. isle
16. ace
17. deaf
18. she
19. none
20. mew
21. skin
22. hunt
23. up
24. day
25. an
26. dad
27. stove
28. ache
29. us
30. him
31. knot
32. me
33. it
34. see
35. earn
36. true
37. bath
38. you
39. wet
40. could
41. them
42. high
43. or
44. low
45. jam
46. ran
47. east
48. toe
49. bells
50. yard

Appendix G

Phonetically Balanced Word List 4

LIST 4

1.	way	26.	ail
2.	buy	27.	chest
3.	smart	28.	thin
4.	eat	29.	gave
5.	odd	30.	rooms
6.	ill	31.	knee
7.	jaw	32.	send
8.	oak	33.	one
9.	else	34.	hurt
10.	show	35.	tear
11.	cap	36.	dumb
12.	tree	37.	with
13.	young	38.	and
14.	air	39.	cars
15.	that	40.	too
16.	does	41.	flat
17.	own	42.	new
18.	hit	43.	key
19.	live	44.	now
20.	move	45.	off
21.	ham	46.	ice
22.	pew	47.	star
23.	die	48.	ease
24.	then	49.	well
25.	your	50.	been